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Catalogue of ***Zeiss Field-Glasses*** *and* ***Portable Stereo-Telescopes.***

Catalogue of ***Binocular and Monocular Stand Telescopes.***

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Catalogue of ***Astronomical Objectives and Astronomical Instruments.***

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We request that the name and address may be plainly written on all orders and, to avoid misunderstandings, that the number, or year of publication, of this edition of our catalogue be quoted.

In telegraphic orders it is sufficient to quote the code-words. In cases where several specimens of the same apparatus are required it is advisable to indicate the quantity desired in words instead of in figures.

Jena, 1902.

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An asterisk denotes that the appliances specified in the general part of this catalogue which are so marked have originated in our Works, i. e., were either introduced by us as new specialities or, at any rate, first made by us in the form there described.

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Preface.

The present volume constitutes the 32nd edition of our Catalogue of Microscopes and Microscopic Accessories and differs in many respects from its predecessor — the 31st edition published in 1898.

In the case of Achromatic Objectives **E** and **F** and the Homogeneous-immersion Objective $\frac{1}{12}''$ we have raised the guaranteed minimum value of their numerical apertures from 0.85 and 1.25 to 0.90 and 1.30 respectively. The benefit of this improvement has, as a matter of fact, already been the property of all objectives supplied by us these last few years.

With regard to new constructions, or to improvements for the first time mentioned in this catalogue, we would specially refer to the following items, viz:

Large Mechanical Stage, No. 44, p. 38; Attachable Mechanical Stage, No. 47, pp. 39 and 41; new form of Micrometer Movement designed by Mr. MAX BERGER, pp. 43—45; Stand for Photo-micrography and Projection (Stand **I^{c}**), pp. 54—56; Stand for the examination of Brain Sections (Stand **I^{d}**), pp. 56 and 57; Stand **VI^{b}**, pp. 64 and 65; small Mineralogical Stand (Stand **IX^{b}**), pp. 69 and 71; Binocular Stands, pp. 72—77; new Drawing Apparatus for low magnifications (Dissecting Stand **P II**), pp. 79—81; GILTSCH's Drawing Stand, p. 91; MALTWOOD's Finder, p. 114; BORN and PETER's Orientation Plate, p. 114.

The text of the catalogue has also undergone considerable changes in the order of its arrangement and the treatment of the subject matter. We have endeavoured withal to group the descriptions of the various appliances in a systematically arranged general division, so as to give this part of the catalogue the character of a comprehensive guide rather than that of a price list.

This modification necessitated the addition of a separate list of prices, to contain merely the descriptive designations of articles together with their prices and serial catalogue numbers and the code-words to be used in telegraphic orders.

Any one who is thoroughly conversant with the construction and uses of the microscope and its accessories will find this list of prices more convenient for reference than the catalogue in its former shape, especially since references to the detailed descriptions and illustrations in the general part appear in parallel columns to those containing the serial numbers.

If, on the other hand, an intending purchaser desires full particulars with regard to the construction of instruments, the present more systematic arrangement of the general part of the catalogue will enable him to find what he requires with the least difficulty. In this case reference to the special list will not be necessary, because prices and code-words are also appended to the separate descriptions of instruments.

With the exception of the price of the large Mineralogical Stand (Stand I^{b}), which we have been able to reduce by Marks 50.—, no material changes have been made in the prices of articles.

A selection of complete microscope outfits, adapted for a great variety of purposes, will be found at the end of the catalogue.

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Objectives and Eye-pieces.

The Glass Works of Messrs. SCHOTT & Co. (which make a speciality of materials for optical and other scientific purposes and which had been established in Jena, with our co-operation, as the outcome of exhaustive experiments extended over several years and carried out by Dr. SCHOTT and Professor ABBE) succeeded in 1884 in producing a series of new glasses possessing certain refractive and dispersive properties which render them more valuable for the construction of microscope lenses than the crown and flint glasses superseded by them.

The use of these glasses, combined with the application of entirely new formulae, has enabled us, since 1886, to produce microscope objectives with markedly superior correction of both the chromatic and the spherical aberrations and, consequently, effecting a much greater concentration of light in the image than had previously been attainable. We introduced simultaneously eye-pieces specially adapted for use with these objectives which, beside facilitating certain other advantages of minor importance, produce almost perfect achromatism and yield a sharp image over the whole area of the visual field.

By a special catalogue published in August 1886 these new combinations were first made known under the designations of "Apochromatic Objectives", "Compensating Eye-pieces" and "Projection Eye-pieces" respectively; and they have since been most extensively adapted, have met with general approbation, and have given most ample proof of the exceptional value of their services in the field of scientific research.

Side by side with the new objectives and eye-pieces we continue to supply our older achromatic objectives with their accompanying ordinary eye-pieces. For, although in the more difficult branches of microscopical research the apo-

chromatic lenses are to an increasing extent supplanting the older objectives, yet there are a great many problems in microscopy that do not demand the highest attainable degree of optical perfection, and in the majority of such cases the older "achromatic" microscope will render as good and sufficient service as ever, provided the instrument be good of its kind, i. e., skilfully and carefully made. The objectives and eye-pieces of the older type have certainly this advantage that, thanks to their much simpler construction, really good lenses of this class can be supplied at prices considerably lower than those of the lenses of the new series, which are much more complicated and involve in their production an extraordinary degree of manual skill.

We should not omit to mention that all advantages derived from the introduction of new glasses and the adoption of improved formulae have been applied equally to the objectives of the older type. The improvements thus effected are of considerable importance, especially in the higher powers of the dry and immersion series, which may therefore, after the example of other makers of similar constructions, appropriately be termed "Semi-apochromatic Lenses".

In our supplementary catalogue of 1886, which deals with the objectives and eye-pieces of the new series, we made our first attempt at introducing a rational system of designation in place of the then prevailing aimless and arbitrary modes of distinction.

Although we believe that this system is of greater practical value than all previous methods of distinguishing lenses and eye-pieces by conventional letters or numbers, and though we would consider its universal adoption to be really a step in the right direction, yet we deemed it wiser to retain, for a time at least, the old designations of our achromatic objectives and ordinary eye-pieces.

The application of a system of designation using a conveniently graduated scale of rounded numbers would in this case necessitate many alterations in the focal lengths of both objectives and eye-pieces. Besides, the extensive use of our microscopes has so thoroughly accustomed our numerous patrons to the old terms — some of them familiarly known for 40 years and more — that any radical change in this direction might give rise to considerable confusion.

Since 1868 all our manufacturing processes follow the system introduced into our works by Professor ABBE, a system which is based upon complete theoretical computation of all the constructive data previous to actual manufacture. By this method it has become possible, through judicious division of labour in the various stages of manufacture under competent scientific supervision, to employ a large number of operatives in the production of lenses of the greatest possible perfection.

The necessity of empirical tests has been entirely obviated by precise mathematical computation of every detail of construction combined with exact technical methods and systematic control of each phase of manufacture. This ensures an extraordinary degree of uniformity in the highest as well as in the lowest powers of our lenses, whilst excluding the bare possibility of inferior productions. All objectives are uniformly free from spherical aberrations up to the marginal zone (assuming correct thickness of the cover-glass with the higher powers) and, as far as possible, from chromatic aberrations also. Special consideration is also given to the compensation of the aberrations in the extra-axial part of the field and to the flatness of the image.

Free working distance. Owing to the importance of a good working distance for the convenient and safe employment of the higher powers particular attention has been given to this factor in calculating the formulae of the various glasses. Our high power objectives possess therefore unusually large working distances in comparison to their focal length and aperture (see Tables on pp. 9, 17, 21).

Tube-length. The objectives specified in this catalogue, except where the contrary is expressly stated, are all adjusted for a tube-length of 160 mm (about $6^1/_2$ in.), reckoned from the shoulder of the objective screw to the upper end of the draw-tube on which the eye-piece rests.

The tube-length may be read off on the larger stands of our make by the divisions on the draw-tube. The interposition of any apparatus, such as a revolving nose-piece, a sliding objective-changer, &c., between the tube and the objective necessitates the shortening of the tube by the length of such intermediate piece so as to make the whole distance between objective shoulder and eye-piece equal to 160 mm (or about $6^1/_2$ inches).

The position of the eye-piece is usually somewhat higher in the case of various oculars of special construction, such as micrometer eye-pieces, screw micrometer eye-pieces, spectroscopic eye-pieces, &c. When using such eye-pieces this must therefore be allowed for, objective-changers, &c., being, if necessary, omitted in order to maintain the correct tube-length.

The lower-power achromatic objectives as far as **C** may also, without appreciable loss, be used on English stands with 10-inch tubes.

All the other objectives, particularly those of the apochromatic series, perform more or less imperfectly on stands of the English type, unless specially adjusted.

If the objectives are to be used with tubes differing from the usual length, this fact should be expressly noted in the orders.

Thickness of cover-glass. All objectives in fixed mounts are, unless otherwise ordered, corrected for a medium thickness of cover, between 0.15 and 0.20 mm. In the higher powers (from the apochromatic objective **8 mm** and the

achromatic **D** upwards), with the exception of the homogeneous immersion objectives, that thickness of the cover-glass which gives the most perfect correction is indicated on the side of the mount by small figures representing millimetres.

With those objectives which we supply in fixed mounts only it is, as a rule, sufficient for ordinary work to use covers of an estimated thickness, but for very exacting tasks we recommend the use of a cover-glass gauge (see p. 95).

A simple method of fairly accurately determining the thickness of cover-glass requisite when using one of our large or medium stands is explained on p. 45.

If it be desired that an objective should be adjusted for a cover-glass differing from the usual thickness, or for use without cover-glass, this requirement should be specified in the order.

Objectives with correction adjustment. The divisions and numbers on the correction collar (*bb*, Fig. 1), which read by a fixed index, indicate (in hundredths of a millimetre) that thickness of cover-glass which gives the best correction corresponding to the position of the collar.

The correction for cover-glass thickness must always be carefully adjusted — particularly in the case of the apochromatic objectives **6 mm, 4 mm, 3 mm** (dry) and **2.5 mm** (water immersion) — otherwise the efficiency of the lenses will be greatly diminished.

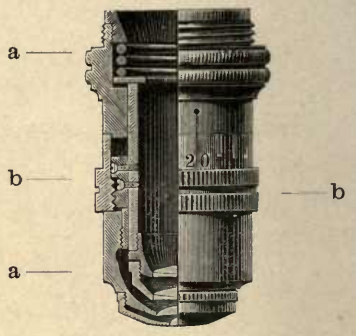


Fig. 1.

Objective fitted with correction-collar.

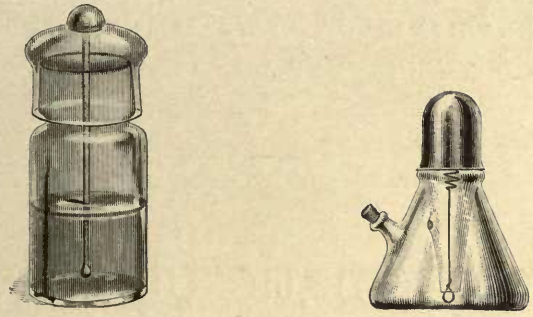
The correction-ring bb serves to adjust the distance between the two upper double lenses and the two lower lenses attached to the mount aa.

(Full Size.)

The **homogeneous immersion objectives** are supplied in fixed mounts only, since their efficiency, within rather wide limits, is independent of the thickness of the cover-glass, and also because any alteration in the lens distances would interfere with the perfection of their correction. Considerable variations in the thickness of the cover-glasses are best compensated for by slightly lengthening the body-tube in the case of excessively thin cover-glasses and by slightly shortening it in that of excessively thick ones.

The **immersion fluid** which we recommend for homogeneous objectives is slightly thickened Cedar-wood Oil (from Juniperus virginiana) as used by us from the first. We expressly desire to caution against the use,

with our lenses, of immersion fluids derived from other sources, as the use of fluids of irregular refractive and dispersive power may entail considerable impairment of the optical performances of the objectives.



a b

Fig. 2. Cap-bottle for Immersion-oil. ($^1/_2$ Full Size.)

The two little bottles shown in Fig. 2[a] and 2[b] afford comfort and convenience in using the immersion oil. The cap and rod of the first-mentioned bottle are made of glass, those of the second, which we originally made on specifications supplied by Dr. L. MACH (see "Zeitschr. f. wiss. Mikrosk.", Vol. XIV, 1897, pp. 348—350), consist of metal.

		Code-words:
Price of bottle with glass cap and rod:	*Marks 1.—.*	**Pabellon.**
„ „ „ *Dr. L. MACH's pattern:*	„ *1.50.*	**Pabulo.**

With each homogeneous immersion objective of our own make we supply gratis one of MACH's bottles with a separate flask containing about 15 gr. of Cedar-wood Oil.

The expression **"Numerical Aperture"**, or "Aperture" simply, was introduced in 1873 by Professor ABBE on the basis of his own theoretical investigations. The value of the numerical aperture is determined by the equation:

$$num.\ Ap. = n.\ sin\ u,$$

n being equal to the refractive index of the medium situated between the cover-glass and the front lens of the objective, u representing half the angle of aperture.

The numerical aperture of a lens determines all its essential qualities: the **brightness of the image** increases with a given magnification, other things being equal, in proportion to the square of the aperture; the **resolving** and **defining powers** are directly proportional to it; the **power of differentiating depth** (the **focal depth**) is inversely proportional to it. (For references to the subject see ABBE on "The Estimation of Aperture" in the Journ. of the R. Microsc. Society, Series 2, Vol. I, 1881, pp. 388—423, and CZAPSKI's "Theorie der optischen Instrumente", Breslau, 1893, p. 224.)

The mounts of all objectives are provided with the **English standard screw** of about 20 mm ($^3/_4$ in.) external diameter.

The name of our firm is engraved on the mounts of all our objectives; on the apochromatic objectives are further engraved the aperture, focal length and tube-length for which they are adjusted, and on the achromatic lenses their distinguishing letters.

When ordering objectives and eye-pieces which are intended for use with stands not made by us, it is advisable to send us the tube in question for adaptation.

*Apochromatic Objectives.

We cannot here do more than briefly describe the essential features of the apochromatic objectives and must refer those who wish to make a more complete study of the scientific aims and principles which govern the construction of these lenses to the paper of Professor ABBE, entitled "Ueber Verbesserungen des Mikroskops mit Hilfe neuer Arten optischen Glases" (Sitzungsberichte der Med.-naturwissensch. Gesellschaft zu Jena, 1886, Vol. XX, pp. 107—128) and to Dr. CZAPSKI's work on the "Theorie der optischen Instrumente", Breslau, 1893.

The peculiar characteristic which, from the optical point of view, distinguishes the objectives of this series from all lens systems previously applied to microscopes lies in the simultaneous realisation of two conditions of concentration of rays, which conditions had hitherto not been fulfilled by any other optical combination, viz: 1) the union of three different colours of the spectrum in one point of the axis, that is to say, the elimination of the so-called secondary spectrum left uncorrected in the older achromatic lenses, and 2) the correction of the spherical aberration for two different colours, in contradistinction to the usual correction for one colour, that in the brightest region of the spectrum only.

With all optical systems constructed up to 1886 the greatest sharpness of the image is limited to one particular colour of the light transmitted while the other rays give more or less confused images, appearing partly as colour fringes surrounding the sharpest image and partly as a general haze spread over the whole field. But with the apochromatic lenses the images are for all colours of the spectrum nearly equally sharp. The quality of the image will therefore be always uniformly perfect whether white or monochromatic light be employed for illumination.

Again, in the older series complete colour correction is obtained for one zone of the objective only, a marked deterioration being observable towards the margin and the centre of the aperture, whilst in the apochromatic lenses uniformly perfect colour

correction is obtained for all zones alike. Consequently, in using ABBE's test plate for instance, scarcely any more colour is perceived with extreme oblique illumination than with semi-lateral or with central light.

Finally, with the ordinary achromatic lenses, even within the zone of their most complete colour correction, only two colours at a time can be united in one point and only for this pair of colours can the images fall on the same spot, considerable focal difference remaining for all others. But, as already mentioned, three colours are brought to a focus in the apochromatic lenses, whereby the focal differences of the various sections of the spectrum are reduced to fractions varying from $^1/_7$ to $^1/_{10}$ of their original magnitude, i. e., are practically eliminated, and this, we will repeat, is done in equal degrees for all zones of the objective. The images due to different colours, each one individually corrected, are thus rendered perfectly coincident and collectively form the final image [1]).

The practical advantages of these new lenses are obvious. Their considerably increased power of concentrating the light with ordinary visual observation or with any other mode of application — and this under all possible conditions of illumination, central or oblique, white or monochromatic — establishes their acknowledged superiority over all earlier constructions, both with respect to optical power and diversity of applicability.

The natural colours of objects, even delicate differences of tint, are faithfully reproduced by these objectives. The images are nearly as sharp close to the margin of the field as they are in the centre.

It is true that, owing to their high aperture and comparatively great working distance, even in these objectives a slight curvature of the image cannot be entirely avoided. Therefore the marginal and central portions of the field do not appear sharply in focus simultaneously, but have to be focused in succession by means of the micrometer screw.

As a result of their great light-gathering power these objectives admit of the use of eye-pieces of very high power, while still retaining satisfactory precision and brightness of the image and thus giving high magnifying powers

[1]) Achromatisation of a higher order in our sense of the term is both theoretically and practically quite another thing than a mere improvement, in degree, of ordinary achromatism, such as would result from a diminution of the secondary spectrum while yet only two colours are united; or than achromatisation embodying the principles here indicated but limited to one particular zone of the objective, as would, for instance, be the case if suitable glasses were introduced in constructions of ordinary type. — Professor ABBE has introduced the word "apochromatic" as a definite technical term for this particular kind of achromatism, so long familiar to scientists as a theoretical idea but only recently realized practically. In order to avoid ambiguity it is desirable that this expression should retain its original meaning as clearly defined by its author, and any attempt to utilize it for purposes of trade advertisement of any other casual improvement in colour correction should be discountenanced.

with relatively great focal lengths and yielding, with the one objective, an extensive series of magnifications.

The list of apochromatic objectives on page 9 specifies in addition to particulars of the numerical aperture and foci also the corresponding initial magnification, i. e., the magnification which the objective alone would give at the distance of distinct vision if used as a single lens. This is simply 250 (distance of distinct vision in millimetres) divided by the focal length of the objective (also given in millimetres). For instance, the initial magnification of a 3 mm objective is:

$$\frac{250}{3} = 83.3.$$

The numerical apertures indicated in the table are the guaranteed minimum values.

Durability of the new Glasses.

In reply to numerous enquiries and, in some cases, publicly expressed doubts we would here state that the kinds of glass used by us since 1895 in the construction of apochromatic lenses, and in a limited degree for the higher powers of achromatic objectives also, have now been so amply tested as to offer an absolute guarantee for their permanency.

In all cases where one of the lenses of an objective supplied by us should exhibit spontaneous changes, we shall continue, in the future (as we have done in the past), to repair such objectives at our own cost, substituting a new lens made of glass which has been thoroughly tested and proved to be permanent.

To this promise we attach, however, the condition that the objective in question be sent to us without previous meddling by others — such as dismounting with a view to cleaning — since any interference, by inexperienced hands, tends in many cases to convert a slight irregularity, easily rectified by us, into a serious, or even irreparable, defect.

We should also point out that, owing to the hyper-hemispherical form of the front lens, which is held in position by a very narrow ridge at the extreme edge of the setting, the apochromatic homogeneous immersion objective of **2 mm** focus and **1.40** num. aperture demands very careful treatment. Even a slight jar by contact with the object may loosen this lens in the mount. The lens of **3 mm** focus and the same aperture combines greater firmness with equal optical capacity.

List of the Apochromatic Objectives.

	Description		Initial Magnification	Combined with Compens. Eye-piece 4, Tube-length 160 mm (about $6^1/_2$ in.)		Prices	Code-words
	Equivalent Focus mm	Numerical Aperture		Free Working Distance mm	Diameter of visible area of object mm	*Marks*	
Dry Series	16	0.30	15.5	5	2	80.—	**Pacato**
	8	0.65	31	1.0	1	100.—	**Pacetor**
	4	0.95	63	0.2	0.45	140.—	**Pacer**
	3	0.95	83	0.15	0.35	160.—	**Paciencia**
Water Immersion	2.5	1.25	100	0.13	0.25	250.—	**Pacificar**
Homogeneous Immersion	3	1.30	83	0.16	0.35	300.—	**Pactar**
	3	1.40	83	0.16	0.35	400.—	**Padilla**
	2	1.30	125	0.14	0.25	300.—	**Padrastro**
	2	1.40	125	0.14	0.25	400.—	**Padre**
	1.5	1.30	167	0.09	0.20	350.—	**Padrino**

Beside the objectives enumerated in this list the following apochromatic objectives are made to order and adjusted exclusively for the 10-inch tube:

12 mm, **0.65** num. Ap. . . . . Price: Mk. **140.—**. Code-word: **Paflon.**

6 mm, **0.95** num. Ap. . . . . „ „ **180.—**. „ **Paganismo.**

The three, **6 mm, 4 mm, 3 mm,** *objectives of the dry series and the* **2.5 mm** *water immersion objective are supplied with correction-collars.*

As to the kind of immersion fluid to be used with homogeneous immersion objectives see page 5.

By **"Free working distance"** as specified in the foregoing table is to be understood the distance between the upper surface of a cover-glass 0.17 mm thick and the lower surface of the lens mount, the lens being sharply focused for an object situated immediately below the cover-glass. As this quantity depends upon the metal mount of the front lens, it is necessarily subject to unavoidable slight variations, and the values given in the table are, therefore, only approximate.

The **diameter of the visible area of the object** is governed by the size of the diaphragm of the eye-piece. The table specifies in millimetres the visible circular area of the object in the case of each combination of component objectives and eye-pieces. These values, too, are slightly fluctuating, as minor variations in the diameter of the diaphragm are also inevitable.

*Compensating Eye-pieces.

All objectives of considerable aperture, from their peculiar construction (hemispherical front lens), exhibit certain colour defects in the extra-axial portion of the visual field (chromatic difference of magnification, see DIPPEL, "Das Mikroskop", 2nd ed., Brunswick, 1882, p. 225—227; CZAPSKI, "Theorie der optischen Instrumente", Breslau, 1893, p. 134). The differently coloured elementary images which combine to form the final image are of different magnitudes, the blue being larger than the red. Whether an image be projected by such an objective without eye-piece, or whether it be examined with one of the ordinary eye-pieces, colour fringes will be observed, increasing towards the margin of the field.

This peculiarity is shared by the apochromatic objectives also, and to their lower powers it has even been intentionally imparted to an approximately similar degree, a means being thereby obtained of almost entirely eliminating this error with the aid of suitable eye-pieces. For this purpose the latter are made to possess an equivalent error of the opposite sign, that is, the image formed by the red rays is larger than that corresponding to the blue rays. Such eye-pieces serve thus to compensate the errors of the objectives and the images then appear uniformly free from colour up to the very edge of the diaphragm prescribing the limits of the visual field, whilst this **edge of the diaphragm** itself shows a **reddish** or **yellowish** border.

The **mounts of the eye-pieces** are so adjusted that the lower focal points of all the numbers lie in the same plane when the eye-pieces are inserted into the body-tube (Fig. 3).

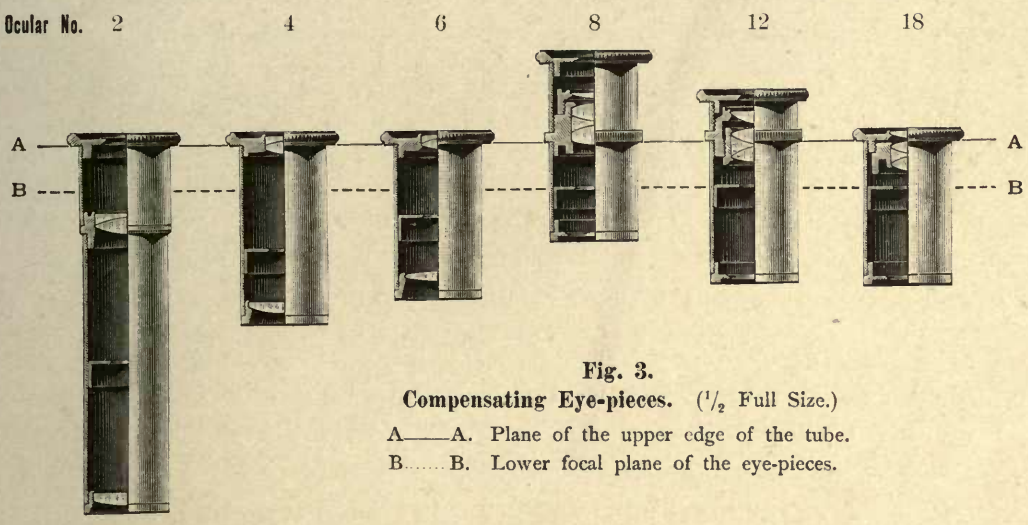


Fig. 3.
Compensating Eye-pieces. ($^1/_2$ Full Size.)
A——A. Plane of the upper edge of the tube.
B.....B. Lower focal plane of the eye-pieces.

We now supply the eye-pieces 8 and 12 in mounts differing somewhat from those shown in the illustration in order that they may also be used with our drawing apparatus.

A change of eye-pieces necessitates therefore scarcely any alteration of focus and the distance between the upper focal point of the objective and the lower focal point of the eye-piece remains constant. This distance, which is the determining element of the sum of the magnifying power, is designated "the optical tube-length" (see above-quoted work by DIPPEL, p. 188).

In continental microscopes with apochromatic objectives and compensating eye-pieces this optical tube-length is 180 mm (about $7^1/_{16}$ in.), irrespective of small differences between various objectives, the tube-length proper (see page 3) being in all cases maintained at 160 mm (about $6^1/_2$ in.).

The **classification of these eye-pieces** is carried out on the plan proposed by Professor ABBE. Accordingly, the numbers which denote how many times an eye-piece, when used with the standard tube-length, increases the initial magnifying power of an objective afford a correct measure of the eye-piece magnifications and, at the same time, furnish the figures for a rational series of distinguishing numbers. In this way the series of our compensating eye-pieces has been arranged by the eye-piece magnifications 2, 4, 6, 8, 12, 18, which supply, at the same time, the distinguishing numbers.

The magnification at an image distance of 250 mm (10 in.) obtained by the combination of a compensating eye-piece with any apochromatic objective may thus be quickly

found by multiplying its number by the numerical value of the initial magnification of the objective. For instance, an objective of 3 mm focus combined with eye-piece 12 gives a magnification of $12 \times 83.3 = 1000$ diameters.

The exceptionally low power eye-piece **2**, known as the **Searcher eye-piece,** serves to extend the effectiveness of the various magnifications required to be successively used with any one objective as far as possible downwards through the lower strata of a specimen also, so as to facilitate preliminary examination and the process of searching for particular points of the object when high-power objectives are being used. By obviating in many instances the necessity of a change, this searcher is particularly useful in combination with immersion objectives, where great inconvenience is caused by having to change a lens already adjusted for another of longer focus.

The **Working eye-pieces** vary in magnifying power from 4 upwards, and even their highest powers can be used with the greatest comfort. In all of them the eye-point (the pupil of emerging rays) lies sufficiently high above the upper lens surface, and the diameter of the lenses is sufficiently large, to completely obviate the inconveniences formerly attending the use of eye-pieces of short focus.

We have recently modified one of the eye-pieces of the compensating series (as well as one each of the series of projection and of the HUYGENIAN eye-pieces). It is a modified eye-piece 4 with a collective lens of enlarged diameter and is distinguished by the designation **Compensating Eye-piece 4*.** Its visual field as compared to that of the ordinary compensating eye-piece **4** is enlarged to the proportion of 3:2. To use this eye-piece (Fig. 4) the draw-tube with the sliding sleeve is removed from the body of the microscope and eye-piece 4* then screwed on in its place. It is fitted with a revolving collar and can be fixed rigidly in any desired position by means of a clamping screw *K*. An iris-diaphragm, by means of which the area of the field may be varied at will — frequently a great convenience in demonstrations — takes the place of the ordinary fixed diaphragm. The eye-lens is mounted in a sliding sleeve, after the manner of our micrometer eye-pieces, thereby adapting it for use with a scale, &c., when desired.

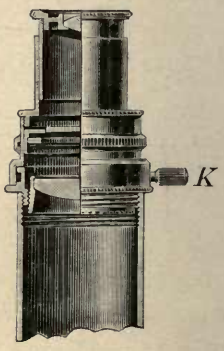


Fig. 4.
Compensating Eye-piece 4* with iris-diaphragm.
($^1/_2$ Full Size.)

The enlargement of the area of the visual field is, however, of real practical value only in the case of the lower-power objectives of **16 mm** and **8 mm**; because the sharp field of the higher powers is not sufficiently large to satisfactorily fill the field of this eye-piece.

Regarding the use of this eye-piece with a special form of Professor ABBE's drawing apparatus see page 89.

List of Compensating Eye-pieces.

	Searcher eye-piece	Working eye-pieces					
Distinctive No.:	2	4	4*	6	8	12	18
Equivalent focal length in mm:	90	45	45	30	22.5	15	10
Price: Marks:	20.—	20.—	40.—	20.—	30.—	30.—	25.—
Code-words:	Pagina	Pagote	Paguro	Paja	Pajada	Pajarel	Pajaro

In subsequent orders for eye-piece 4* the size number of the stand with which it is to be used should be stated.

When ordering eye-pieces for stands of other makers it is necessary to send us an exact impression in sealing wax of the tube edge or, better still, to send the tube in question to our works.

Compensating eye-pieces for the English tube. Beside those enumerated above the following compensating eye-pieces are made to order for the 10-inch tube.

2^{e}: Equivalent focal length: 135 mm, Price: Mk. 25.—. Code-word: **Pajarete.**
4^{e}: „ „ „ 67 „ „ „ 25.—. „ **Pajarico.**
8^{e}: „ „ „ 34 „ „ „ 35.—. „ **Pajarillo.**

The compensating eye-pieces for the continental tube may also be used on the 10-inch tube, but in order to obtain correct eye-piece magnification for a tube-length of 250 mm (about 10 in.) it is necessary to multiply the figures engraved on the eye-pieces by 1.5.

Table of Magnifications of the Apochromatic Objectives with the Compensating Eye-pieces.

Calculated for 160 mm (about 6$^{1}/_{2}$ in.) tube-length and an image distance of 250 mm (about 10 in.).

Focus of the objective	Searcher eye-pieces	Working eye-pieces				
mm	2	4 & 4*	6	8	12	18
16.0	31	62	94	125	187	281
8.0	62	125	187	250	375	562
4.0	125	250	372	500	750	1125
3.0	167	333	498	667	1000	1500
2.5	200	400	600	800	1200	1800
2.0	250	500	750	1000	1500	2250
1.5	333	667	1000	1334	2000	3000

With objectives adjusted for the 10-inch tube it is necessary to multiply the magnifications given in the table by 1.5.

*Projection Eye-pieces.

The Projection eye-pieces introduced by us simultaneously with the compensating eye-pieces, both of which are corrected on the same principle, are designed exclusively for the purposes of micro-photography and micro-projection.

For detailed information as to their construction and special application we would refer to the new edition of our Catalogue of Photo-micrographic and Projection Apparatus.

The prices of the various forms of Projection Eye-pieces will be found in the Price-list at the end of the Catalogue.

Achromatic Objectives.

Aided by the considerably extended list of materials produced by the local glass works we have reconstructed most of the older types of our achromatic objectives so as to obviate in these lenses also, more completely than had formerly been possible, imperfections due to spherical and chromatic aberration. With those lenses of the dry series which have a numerical aperture exceeding 0.65 this improvement, apart from greater sharpness and clearness of the image, is also manifested by increased sensibility to differences in the thickness of the cover-glass and the length of tube. Consequently, in the use of these lenses now even closer attention must be given to these two points than formerly.

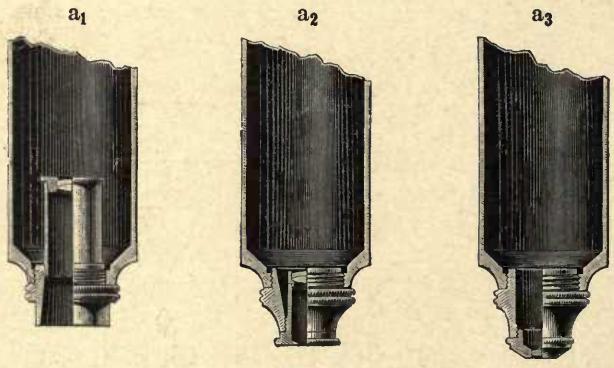


Fig. 5. Objectives a1, a2, a3, attached to the tube.
(1/2 Full Size.)

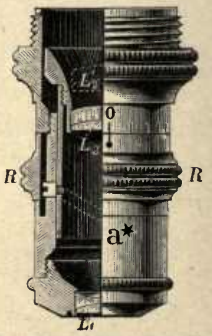


Fig. 6. Objectiv a*.
By rotation of the ring *RR* the upper pair of lenses (L_2) may be elevated into the position L'_2, indicated by dotted lines.
(Full Size.)

Our lowest power objectives, viz: a_0, a_1, a_2 and a_3, are simple achromatic lenses, so mounted that, notwithstanding their great focal length, the body of the microscope remains at its ordinary elevation during observation. For this purpose lenses a_0 and a_1 have their threads so placed that, when screwed into the tube, the lens is inside the body (see a_1, Fig. 5), and they cannot therefore be used with a revolving nose-piece or other objective-changer. Though the former is primarily intended for use with our binocular microscopes, we now also supply it in a mount resembling that shown in Fig. 5 (a_1) thereby adapting it to other stands, except the Mineralogical Stands I^b and IX^b.

Objective a* (Fig. 6) consists of two achromatic lenses combined after an original formula of our own computation. By means of a ring *RR*, rotating like a correction-collar, the lenses may be brought closer together or separated, whereby, in combination with an eye-piece, the magnification can be so greatly varied that its power is doubled by changing the position of the index from 0 to division 10 of the scale.

At the suggestion of Mr. BRATUSCHECK we have in 1890 added to the water immersion series a lens giving a large free working distance but having a relatively small aperture, viz: **Objective D*.** Its special purpose is to facilitate the examination of living organisms floating in water-troughs at intermediate magnifications (200 to 500 diameters). Its great working distance gives to the microscopist a relatively wide range in following the motions of such creatures through both the upper and lower strata of the water. The peculiar construction of the lens tends to restrict the greatest sharpness of the image to the central portion of the field.

The lens may be used with or without cover-glass and gives equally good images with fresh as with sea water.

The **water immersion objective Pl,** an optical combination devised by Dr. H. HARTING and introduced by us in 1898 under the designation of the **Plankton-Searcher,** serves essentially the same purposes as the lens just previously described. Owing to its long focus this objective yields only low magnifications, and though its aperture is 0.11, it gives the very large working distance of about 36 mm. In combination with different eye-pieces its optical qualities (magnification and diameter of field) differ but slightly from those of the lens **aa**, and the depth of vision is equally considerable in both forms of objective. The use of new kinds of glass, capable of resisting the influence of water, in the construction of these lenses has facilitated a well-nigh apochromatic correction.

For use with this objective we make deep glass cells, cemented on slides.

Price: *Mk. 3.50.* Code-word: **Pajarita.**

Compensating eye-pieces, when used with achromatic objectives, should only be employed with those of large aperture, such as the **DD** — 0.85 and upwards.

All these objectives are also supplied adjusted for the English 10-inch body (tube length = 250 mm [about 10-in.]).

Special mahogany cases for objectives and eye-pieces, with locks.

Price according to size from Mk. 15.— to 30.—.

Fig. 7.

Mahogany case for objectives and eye-pieces.

List of Achromatic Objectives.

	Designation	Equivalent focal length mm	Numerical Aperture	Combined with HUYGEN. eye-piece 2; Tube-length 160 mm (about $6^1/_2$ in.) Free Working Distance mm	Combined with HUYGEN. eye-piece 2; Tube-length 160 mm (about $6^1/_2$ in.) Diameter of visible area of object mm	Price without | with Correction-Collar Marks	Code-words
Dry Series	a_0	45	—	32	14	12.—	Pajeria
	a_1	39	—	20	11	12.—	Pajillo
	a_2	37	—	30	8	12.—	Pajonal
	a_3	28	—	33	4.5	12.—	Pajuncio
	a*	43—29	—	13—53	10—25	40.—	Pajuela
	aa	26	0.17	14	4	27.—	Palabra
	A	15	0.20	9	2	24.—	Palacial
	AA	17	0.30	7.5	2.5	30.—	Palacio
	B	12	0.35	3	1.5	30.—	Paladar
	C	7	0.40	1.8	0.9	36.—	Paladino
	D	4.2	0.65	0.6	0.5	42.—	Palamallo
	DD	4.3	0.85	0.4	0.5	54.— 74.— Palamenta	Palanca
	E	2.8	0.90	0.25	0.35	66.— 86.— Palampora	Palangana
	F	1.8	0.90	0.17	0.23	84.— 104.— Palatal	Palastro
Water Immersion	Pl Plankton-Searcher	25	0.11	36	4	20.—	Palecer
	D*	4.4	0.75	1.5	0.55	75.—	Palente
	H	2.5	1.18	0.2	0.32	110.— 130.— Palatina	Paletada
	J	1.8	1.18	0.2	0.23	144.— 164.— Paleton	Paletero
Homog. Immersion	$\frac{1''}{12}$	1.8	1.30	0.15	0.25	160.—	Paliador

For definition of the terms "Free working distance" and "Diameter of visible area of object" see p. 10.

With regard to the kind of immersion fluid to be used with homogeneous immersion objectives refer to p. 5.

*Assorted pairs of Objectives for Binocular Microscopes.

The combinations **Pl (Plankton-Searcher)**, a_3, a_2, a_0, and one of still lower power, namely of **55** mm (about $2^1/_4$ in.) focal length, for use with binocular microscopes are supplied in a special form of setting and mounted in pairs on slides.

We apply to such pairs of objectives the following distinguishing marks, viz: (55), (a_0), (a_2), (a_3), (Pl).

Designation of pair of objectives:	(55)	(a_0)	(a_2)	(a_3)	(Pl)
Price: Marks	**45.—**	**45.—**	**45.—**	**45.—**	**55.—**
Code-words:	**Palido**	**Palinodia**	**Palma**	**Palmado**	**Palmear**

A pair of suitable diaphragms to slip on, which should be used whenever it is desired to obtain an image perfectly uniformly sharp up to the margin, is supplied with each set of paired objectives (a_0).

For tables of magnification, free working distance and area of visible field of these objectives see p. 21.

Projection Lenses and Micro-Planars.

The projection lenses and micro-planars formerly specified in our Catalogues of Microscopes are, as are also the projection eye-pieces, designed for the purposes of photo-micrography and projection. For fuller details as to the construction and applicability of these combinations please refer to the new edition of our Catalogue of Photo-micrographic and Projection Apparatus.

See list of prices on p. 120.

Huygenian Eye-pieces.

We supply HUYGENIAN eye-pieces for use with achromatic objectives in five different powers. The various focal lengths of these eye-pieces are serially graduated so that, with due regard to their peculiar variations in the position of their lower focal points, the magnifications × 3, 4, 5.5, 7 and 9 are obtained if the tube-length of 160 mm be maintained throughout.

We make also a **Huygenian ocular 2* with iris-diaphragm** similar to the compensating ocular **4***.

What has been said with regard to compensating eye-piece **4*** applies equally to this HUYGENIAN eye-piece **2***. (See p. 12.)

Regarding eye-pieces for special purposes (micrometer, spectroscopic, &c.) see under heading of Accessory Apparatus, pp. 92, 93, 106.

We would particularly emphasize the fact that HUYGENIAN eye-pieces are designed for use with achromatic objectives **only.**

List of Huygenian Eye-pieces.

Eye-piece No.	1	2	2*	3	4	5
Equivalent focus in mm	50	40	40	30	25	20
Eye-piece magnification	3	4	4	5.5	7	9
Price: Marks	7.—	7.—	30.—	7.—	7.—	7.—
Code-words:	**Palmula**	**Palombin**	**Palomero**	**Palota**	**Palpebra**	**Palpitar**

In subsequent orders for eye-piece 2* the factory number of the stand should be noted.

We supply in addition **two forms of the Ramsden eye-piece,** one of them in combination with our screw micrometer eye-piece (see p. 93), the other, which is termed **Orthomorphic eye-piece 4** (see p. 72), for use with binocular microscopes.

Table of Magnifications of the Achromatic Objectives with Huygenian Eye-pieces,

calculated for a tube-length of 160 mm (about 6½ in.) and an image distance of 250 mm (about 10 in.).

Objectives	Huygenian Eye-pieces				
	1	2 & 2*	3	4	5
a_0	6	8	12	15	22
a_1	7	10	16	20	30
a_2	11	15	23	28	41
a_3	20	26	38	47	68
a*	3—8	5—12	8—18	10—22	16—33
aa	24	31	46	56	81
A	44	56	78	97	144
AA	42	54	74	91	134
B	63	80	115	140	200
C	100	125	180	220	315
D	175	220	320	390	550
DD	175	220	320	390	550
E	270	340	495	600	860
F	415	520	760	930	1300
Pl Plankton-Searcher	25	33	48	58	84
D*	175	220	320	390	550
H	305	385	555	680	960
J	415	520	760	930	1300
$\frac{1''}{12}$	420	530	770	940	1320

Table of Magnifications of the higher powers of Achromatic Objectives with the Compensating Eye-pieces,

calcul. for a tube-length of 160 mm (ab. 6 1/2 in.) and an image dist. of 250 mm (ab. 10 in.).

Objectives	Compensating Eye-pieces					
	2	4 & 4*	6	8	12	18
DD	110	220	330	440	660	990
E	180	360	540	720	1080	1620
F	260	520	780	1040	1560	2340
H	185	370	555	740	1110	1665
J	260	520	780	1040	1560	2340
1/12"	260	520	780	1040	1560	2340

Table of Magnifications, Free Working Distances and Diameters of the Area of Objects embraced by pairs of Objectives adjusted for Binocular Microscopes,

calculated for an image distance of 250 mm (about 10 in.).

Pair of Objectives		Huygenian Eye-pieces						Ortho-morphic Eye-piece 4	
		1		2		3			
Desig-nation	Free working distance mm	Magni-fication	Diameter of visible area of object mm	Magni-fication	Diameter of visible area of object mm	Magni-fication	Diameter of visible area of object mm	Magni-fication	Diameter of visible area of object mm
(55)	70	8	13	10	13	13	10.5	15	7.5
(a_0)	54 without diaphragms | 40 with	13	7.5	16	7.5	23	6.5	28	4.0
(a_2)	40	20	5.0	24	5.0	33	4.2	45	3.0
(a_3)	30	30	3.3	35	3.2	50	2.7	65	2.0
(Pl)	35	35	3.0	42	3.0	58	2.5	72	1.8

Dissecting Lenses and Hand Magnifiers.

In addition to the objectives and eye-pieces included in complete microscopic sets we also supply a variety of dissecting combinations and hand magnifiers, some of them exclusively intended for use with our dissecting stands and lens holders, others suitable for use as hand lenses also.

In the construction of these lenses our special aim has been to combine ample working distance with the greatest possible flatness of field.

We supply three different forms of a lens based upon the type evolved by **BRÜCKE** — combination of a collective with a dispersive element — viz:

1. ***Dissecting Combination Lens,** No. **1,** Fig. 40 P. The collective element, which consists of three achromatic lenses, is combined with an achromatic dispersive lens serving also as eye-piece. As the component collective lenses may be used separately as well as in combination with the dispersive lens, a useful series of six conveniently graduated magnifications (see Table), varying between × 11 and 100, combined with a comparatively large working distance (from 6 to 26 mm), can be obtained.

		Magnification	Free working Distance mm	Diameter of visible area of object mm
3 Lenses	with eye-piece	100	8	1.4
2 „		60	15	2.4
1 „		40	26	3.7
3 Lenses	without eye-piece	30	6	5
2 „		17	11	8
1 „		11	17	10

This dissecting combination lens is primarily designed for use with our Dissecting Stands **P I** *and* **P III.**

We also supply the Combination Lens, No. **1**, fitted to a sliding sleeve to which a small stage with spring object-holders is attached. In this form the lens is known under the designation of **"The improved Algascope"**, No. **2**.

If a sliding sleeve of this description be ordered separately, it is necessary to send us the lens combination for adaptation.

		Code-words:
Price of the Dissecting Combination Lens, No. **1** . .	*Marks 40.—.*	**Paludato.**
„ „ „ *improved Algascope,* No. **2**	„ *48.—.*	**Palustre.**
„ „ „ *Sliding sleeve with stage,* No. **2a** . . .	„ *8.—.*	**Pallar.**

2. **Large Dissecting Lens,** No. **3,** with double objective having collective lenses of 33 mm aperture and a dispersive lens whose distance from the former may be varied. The magnification varies with the position of the dispersive lens within a margin of × 5 to × 10, and the free working distance ranges between 70 and 60 mm; see Fig. 43.

3. **Small Dissecting Lens,** No. **4,** of simpler construction than the preceding, magnifying 4 to 5 times.

The two last-mentioned BRÜCKE *lenses are specially adapted for Stands* **L I** *and* **L II.**

Aplanatic Lenses, STEINHEIL's formula, consisting of three cemented lenses (see Fig. 8 and 9) and likewise giving large working distances, are supplied by us in two distinct forms, viz:

1. **Aplanatic Lenses,** Nos. **5—8,** Fig. 8, **of the earlier type,** having only a moderately flat field. Of this type we supply four different lenses, magnifying from 6 to 30 times. The higher powers are adapted for use with dissecting stands, the lower ones as hand lenses or with a lens holder.

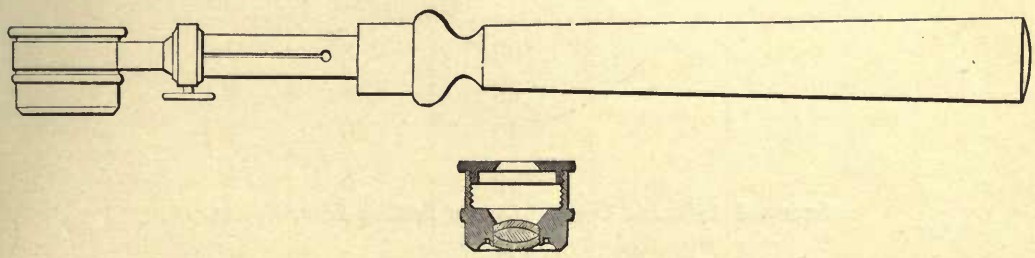


Fig. 8.
Steinheil Aplanatic Lens, No. 7, with Handle, No. 19 (20 ×).
(Full Size.)

2. ***Improved Aplanatic Lenses,** Nos. **9** and **10**; possessing an **exceptionally large** and **flat field.** Magnifications 6 and 10 ×, the diameter of the lenses being 22 mm in the case of the former (Fig. 9 and 10) and 13 mm in the latter case.

The advantages derived from the size and flatness of the field of these lenses can only be utilized to the fullest possible extent by holding them correctly, i. e., close to the eye.

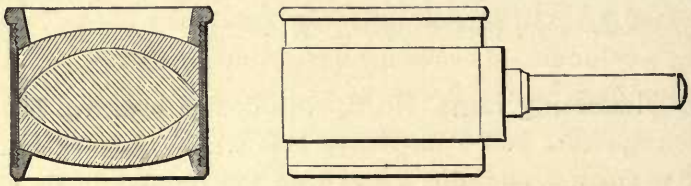


Fig. 9.

Improved Aplanatic Lens 6 ×, No. 9.

(Full Size.)

The improved aplanatic lenses are also, if desired, supplied in the form of **Folding Lenses**, Nos. **11** and **12**, (Fig. 10), at an additional cost of Marks 3.—.

Fig. 10.

Improved Aplanatic Lens 6 ×, as a Folding Lens, No. 11.

(Full Size.)

Both types of the improved aplanatic lenses (Nos. ***9*** *and* ***10****) are adapted for use with any of our dissecting stands, except* **PV**, *as well as with lens holders.*

To facilitate the free-hand use of the aplanatic lenses, Nos. **5—10,** we also supply a convenient **handle with a ring,** No. **19,** for inserting the lenses (Fig. 8).

Price of Handle with ring: Marks 3.—. Code-word: **Pano.**

Tripod Stands, No. **20,** are only supplied for use with the improved aplanatic lenses, Nos. **9** and **10.**

Price of Tripod Stand: Marks 3.—. Code-word: **Panoso.**

In addition to the lenses already specified we keep an assortment of others of simpler construction, viz: the so-called **Doublets,** Nos. **13** and **14,** magnification 15 × and 30 ×; and the so-called WILSON Magnifiers, Nos. **15** and **16,** consisting of two lenses in brass mounts, which give magnifications of 5 or 10 diameters according as the lower lens is used singly or both are used in combination.

These last-mentioned simplified lenses are specially adapted for our Dissecting Stands **P V** *or for free-hand use.*

A handy **Pocket-magnifier,** No. **17,** consists of two achromatic lenses and is made in the form of a folding lens with ivory mounts. The single lenses yield magnifications of × 3 and × 5 respectively, the two lenses combined that of 8 diameters.

For the rapid examination, under high magnification, of specimens of algae or similar objects we supply an **Algascope,** No. **18,** with magnification of 120 diameters. It consists of a simple hemispherical lens in metal mount, with glass plate for supporting the object and a focusing screw.

For particulars of the ***improved Algascope*** *refer to p. 23.*

When subsequently ordering lenses which are intended for use with dissecting stands or lens holders, particulars of the latter should be given to enable us to provide the necessary holders and adapters.

All lenses, except folding lenses, are supplied in wooden cases with inscription.

Synopsis of Magnifiers.

Type of Lens	Magnification at an image distance of 250 mm (10 in.) ×	Free working distance mm	Diameter of visible area of object mm	Price Marks	Code-words
Large BRÜCKE dissecting lens No. 3	5—10	70—60	13—7	25.—	**Pampana**
Small BRÜCKE dissecting lens No. 4	5	70	20	16.—	**Pampero**
STEINHEIL aplanatic lenses No. 5	6	34	18	15.—	**Pamplina**
STEINHEIL aplanatic lenses „ 6	12	20	9	15.—	**Panace**
STEINHEIL aplanatic lenses „ 7	20	10	3.5	12.—	**Panadizo**
STEINHEIL aplanatic lenses „ 8	30	7	2	12.—	**Panal**
Improved aplan. lenses No. 9	6	32	30	18.—	**Pancada**
Improved aplan. lenses „ 11	6	32	30	as Folding Lens 21.—	**Pancreas**
Improved aplan. lenses „ 10	10	12	15	18.—	**Pandear**
Improved aplan. lenses „ 12	10	12	15	as Folding Lens 21.—	**Pandereta**
Doublets No. 13	15	13	4	6.—	**Pandorga**
Doublets „ 14	30	5	2	6.—	**Panecilla**
Two-lens magnifier No. 15	5	40	25	In brass mount 6.—	**Panera**
Two-lens magnifier „ 16	10	13	14	In plainer mount 5.—	**Panfilo**
Pocket-magnifier with two achromatic lenses No. 17	3	60	35	12.—	**Panico**
Pocket-magnifier with two achromatic lenses No. 17	5	45	30		
Pocket-magnifier with two achromatic lenses No. 17	8	25	15		
Algascope No. 18	120	2	0.2	8.—	**Pantano**

The data respecting free working distance apply to adjustments for a normal-sighted observer, and the distances are rather shorter with short-sighted and greater with long-sighted persons. The same applies to the values of the linear diameter of the field as given above, which are, therefore, only approximate and intended to give merely a rough idea.

Stands.

Microscope Stands.

The general form of stands of continental design, which originated in the type first introduced by OBERHÄUSER and was subsequently developed by HARTNACK, has undergone many important alterations within the course of the second half of the past century.

The introduction of the ABBE illuminating apparatus, various new features in the construction of the stage, and considerable improvement of the means of focusing mark the material progress which is particularly noteworthy in the case of monocular stands.

These fundamental changes in the construction of the older universal type of stand have demonstrated to us the necessity of also modifying our binocular stands, originally designed by GREENOUGH, which we introduced some years ago.

A. Illumination of the Object.

I. Illumination by transmitted light.

Modern microscopy relies mainly on illumination by transmitted light, with a concomitant facility for a wide variation of the incident pencil both as regards its angular aperture and its direction. Both these requirements are fully met by the **ABBE Illuminating Apparatus,** first introduced by us in 1872 (see "M. SCHULTZE's Archiv für mikrosk. Anatomie", vol. IX, 1873, pp. 469—480). The use of this apparatus has in the course of the last few decades become so

general, and it has been so universally acknowledged as an indispensable accessory in advanced microscopic work, that it now justly forms an essential adjunct to all the larger stands intended for scientific research.

Particulars regarding the construction and application of this apparatus may be found in the detailed directions for use which are issued with each stand fitted with the ABBE illuminating apparatus.

The various lens systems — so-called **Condensers** — which are adapted for use with the ABBE illuminating apparatus are all mounted in such a manner that they can be conveniently inserted into the **sliding sleeve** of the apparatus and may, if necessary, be champed in any position (see Fig. 11[a]). Since 1886 we have invariably added an **iris-diaphragm,** which facilitates a very gradual variation of the aperture. The smallest opening of the iris has a diameter of about 1 mm, while the largest has one of 32 mm, so that it may remain in its place when either the polarizer or the central-stop diaphragm for dark-ground illumination is in use, or when, according to KOCH's method, the condenser is used at full aperture.

In addition to bearing the different types of condensers the sliding sleeve of the apparatus also serves to carry the following appliances, viz: the ordinary cylinder-diaphragm, the iris cylinder-diaphragm, the appliance for centring objectives used as condensers, the illuminating apparatus for spectroscopically decomposed light.

All stands fitted with an ABBE illuminating apparatus thus give facilities for interchanging all the various appliances mentioned above.

We only supply the ABBE illuminating apparatus with one of the following Stands: I, II[a] and IV[a]. Its adaptation to other stands — if at all practicable — always entails extensive structural alterations which have to be carried out in our own works.

The various diaphragms, condensers, &c. used in connection with the apparatus are, however, supplied separately as follows:

1. The **Cylinder-Diaphragm,** No. **21,** Fig. 11[c], which is a sliding sleeve fitted with 3 stops yielding apertures varying from 0.5 to 6 mm diameter.

Price: Marks 4.—. Code-word: **Pantografo.**

2. The ***Iris-cylinder Diaphragm,** No. **22.** In order to obtain a gradual variation of the illumination when working without a condenser, we have constructed the iris-cylinder diaphragm. The laminae forming the apertures of these diaphragms are arched in the shape of a cupola so that, when the iris is entirely closed, their edges almost touch the lower side of the object slide.

Price: Marks 14.—. Code-word: **Pantuflo.**

With the swing-out condenser (which see under sub-head 7) the iris-cylinder diaphragm is combined with the condenser system in the same sliding sleeve. (See Fig. 12.)

The cylinder-diaphragms and the iris-cylinder diaphragms, as supplied with the ABBE illuminating apparatus, can also be used in connection with the sliding sleeve of Stand **IV^b**.

In subsequent orders for cylinder and iris-cylinder diaphragms the factory number of the stand with which they are to be used should be quoted.

3. The **Iris-Diaphragm,** No. **23.** The ordinary iris-diaphragm, as always supplied with the illuminating apparatus, may also be obtained singly.

Price: Marks 10.—. Code-word: **Panzudo.**

4. **Diaphragms for dark-ground illumination,** No. **24.** As a thoroughly good dark-ground illumination is only possible when the diameter of the central stop of the diaphragm bears a certain definite relation to the numerical aperture of the objective, we shall no longer supply these stops with the ABBE illuminating apparatus but will send them, together with any necessary stops for slipping or screwing into the lens mounts, to order and at special rates only. When ordering, the objectives which are to be used should be specified, since their apertures and the nature of their mounts govern the size of the stops. It should also be stated whether they are intended for a condenser of 1.20 or for one of 1.40 numerical aperture (see Directions for using the Illuminating Apparatus).

	Price:	Code-words:
a) Central-stop diaphragm with button for the central stops	*Mk. 0.50.*	**Papado.**
b) Central-stops, each	„ *1.—.*	**Papagallo.**
c) Objective-stops, to screw into the mounts, *for achromatic objectives,* each	„ *0.60.*	**Papalina.**
d) Objective-stops, to slip into mounts from above, *for apochromatic objectives,* each	„ *1.50.*	**Papanatas.**

Objectives fitted with correction collars are not suitable for dark-ground illumination.

5. **Condenser Combination,** double lens, No. **25** (Fig. 11^a), numerical aperture 1.20, equivalent focal length 12 mm, in sliding sleeve.

Price: Marks 20.—. Code-word: **Papaga.**

6. **Condenser Combination,** triple lens, No. **26** (Fig. 11^b), numerical aperture 1.40, equivalent focal length 8 mm, in sliding sleeve.

Price: Marks 25.—. Code-word: **Papelear.**

7. ***Swing-out Condenser,** Nos. **27** and **28,** with iris-cylinder diaphragm (Fig. 12).

This form of condenser was introduced by us in 1894 (see Zeitschr. f. wiss. Mikrosk., vol. XI, 1894, pp. 433—440). The apparatus offers the advantage of having the condenser and the iris-cylinder diaphragm combined. By the aid of a suitable mechanism the condenser system may be folded clear of the carrier of the iris-cylinder diaphragm and swung aside so as to facilitate, by simple means, a change from illumination by mirror and condenser (convergent rays) to that by mirror alone (parallel rays).

We supply the apparatus fitted with either the double or the triple lens-combination.

Price of swing-out condenser, No. **27** *(with No.* **25***) Marks 45.—.* Code-word: **Papeleta.**

„ „ „ „ „ **28** *(* „ „ **26***)* „ *50.—.* „ **Papenco.**

In subsequent orders for condensers specified under 5—7 the factory number of the stand should be mentioned.

8. ***Centring Achromatic Condenser,** No. **29** (Fig. 11[d]), numerical aperture 1.0, equivalent focal length 14 mm.

In this form of condenser the concentration of the illuminating rays is effected by means of an iris-diaphragm situated between the lenses, wherefore the diaphragm-carrier of the illuminating apparatus should be moved aside during use.

Price in case: Marks 75.—. Code-word: **Papion.**

Although in comparison to the condensers specified under 5—7, which consist of ordinary lenses, achromatic condensers may afford scarcely any special advantage in visual observation, they admit, owing to the more complete union of rays effected by them, of a sharp image of the source of light being projected into the plane of the object, and this is frequently advantageous for the purposes of photo-micrography and projection.

9. ***Centring Achromatic Condenser possessing great focal distance,** No. **30,** numerical aperture and focal length as above. This form of condenser was suggested by Professor ROLLETT of Graz. It is specially designed to admit of the use of ZOTH's cooling trough (see p. 114) which should be placed directly below the object.

The aperture is regulated by means of the iris-diaphragm of the illuminating apparatus.

Price in case: Marks 100.—. Code-word: **Papula.**

10. ***Centring Achromatic Condenser with enlarged aperture,** No. **31,** numerical aperture 1.30, equivalent focal length 9 mm, Fig. 11[e]. By virtue of its large numerical aperture this condenser admits of the application of an exceptionally large or of a very oblique illuminating cone, unaffected with the pronounced aberrations invariably present in the cone of rays yielded by ordinary non-achromatic condensers. The slides used with this apparatus may not exceed a thickness of about 0.7 mm.

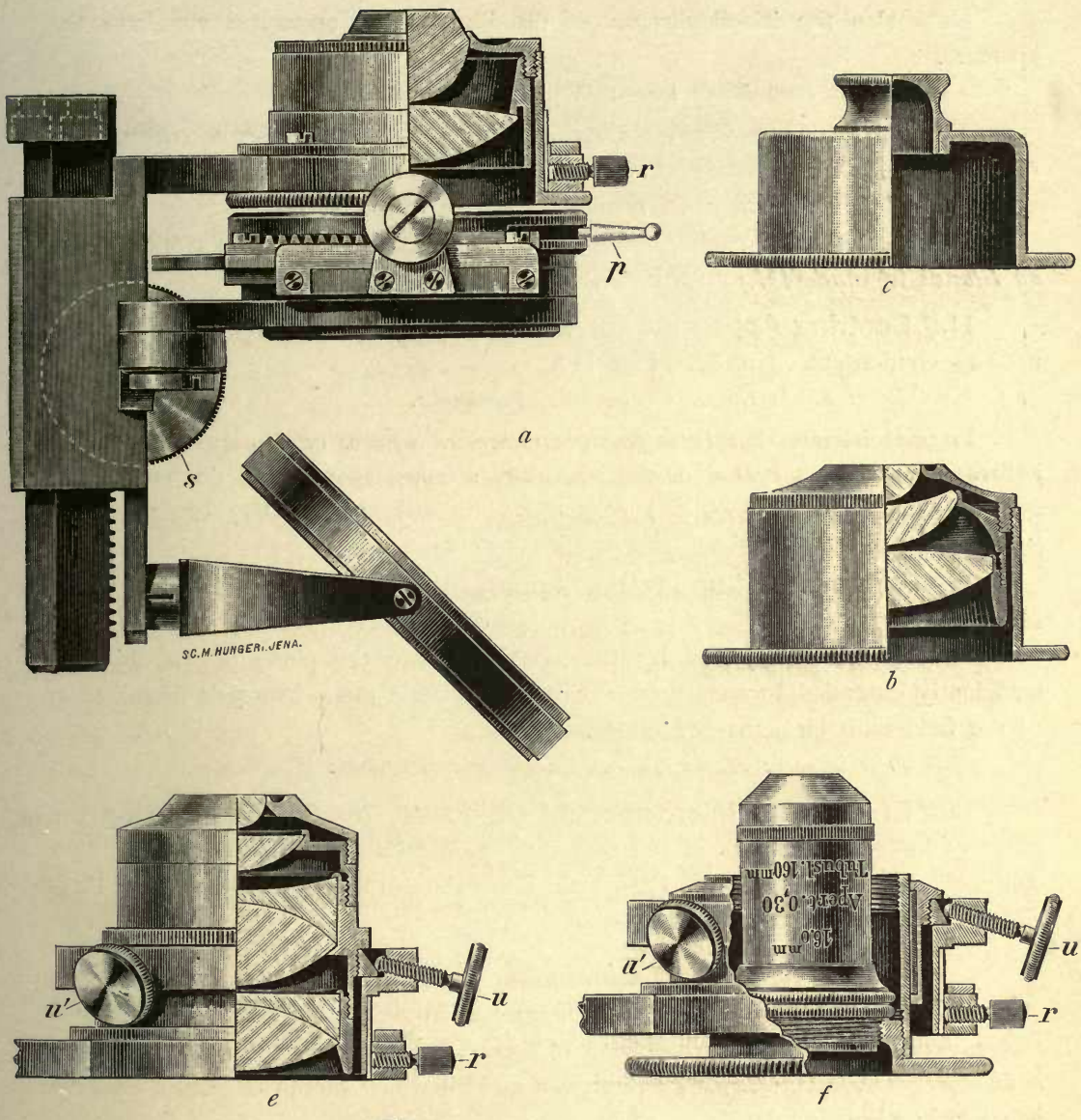


Fig. 11.

Showing the **Abbe Illuminating Apparatus** with cylinder-diaphragm, various condensers and the centring apparatus for objectives.

r: screw for clamping the condenser in the sliding sleeve; *p*: knob of iris-diaphragm; *u* and *u'*: centring screws; *s*: mechanism for elevating and depressing the illuminating apparatus.

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Here also the iris-diaphragm of the illuminating apparatus regulates the aperture.

Price in case: Marks 100.—. Code-word: **Paquira.**

The achromatic condensers specified under 8—10 ***slip from above*** *into the sleeve of the illuminating apparatus, which must therefore be completely racked downwards before inserting the condenser system (see Fig. 11).*

These condensers cannot be used on the large Mineralogical Stand **I^b**, *or on Stands* **II^a** *and* **IV^a**, *excepting in their inclined position.*

11. ***Centring Apparatus for Microscope Objectives** which are to be used as condensers. No. **32.** Fig. 11 f.

Price: Marks 12.—. Code-word: **Parabanda.**

In many instances it appears desirable to use achromatic, or also apochromatic, objectives as illuminators instead of the condensers specified above. For this purpose we supply a sliding sleeve with centring collar into which such objectives may be screwed and which fits into the sleeve of the illuminating apparatus.

12. **HARTNACK'S Illuminating Apparatus for monochromatic light,** No. **33.**

The spectrum projected by this apparatus into the plane of the object is sufficiently extended to ensure approximately uniform monochromatic illumination of the field with high magnifications.

Price in case: Marks 120.—. Code-word: **Paradero.**

13. ***ENGELMANN'S Micro-spectral Objective,** No. **34,** for observing the effect of individual colours of the spectrum upon microscopical objects (see "Bot. Zeitung", vol. XL, 1882, pp. 419—426; also "PFLÜGER's Archiv f. d. ges. Physiol.", vol. XXVII, 1882, pp. 485—490.)

Price in case: Marks 160.—. Code-word: **Paradigma.**

14. ***ROLLETT'S Spectro-Polariser,** as modified by DIPPEL, No. **35,** for determining the character and degree of double refraction in microscopical objects (see "Zeitschrift f. Instrumentenkunde", vol. I, 1881, p. 366—372 and DIPPEL, loc. cit., p. 619.)

With selinite films for red of the II. and III. order.

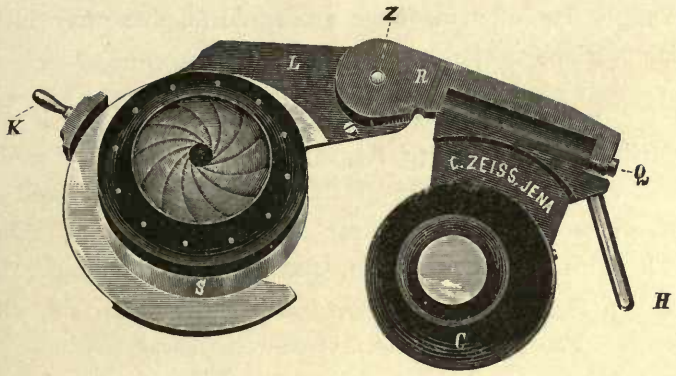
Price in case: Marks 200.—. Code-word: **Paradura.**

The apparatus specified under 12—14 can only be used on Stands **II^a** *and* **IV^a** *in their inclined position.*

Special **Centring Collar,** No. **36,** for Nos. 12—14.

Price: Marks 6.—. Code-word: **Parafraste.**

We shall be pleased to send to applicants detailed particulars of the apparatus (specified above under 12—14) for spectroscopically decomposed light.



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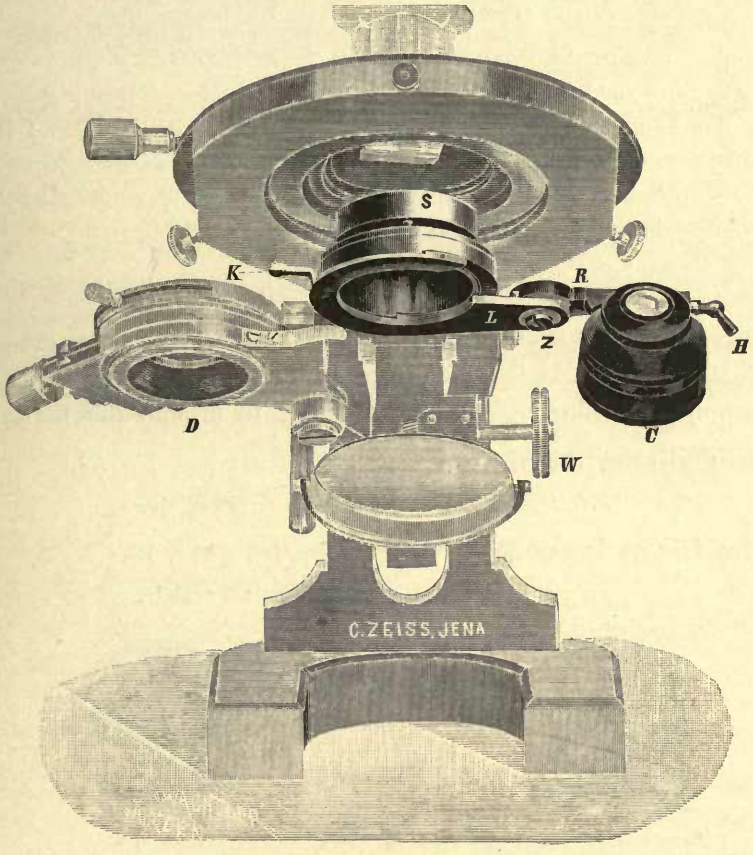


B

Fig. 12. Swing-out Condenser.

At "A" the condenser is represented clear of the sliding sleeve of the illuminating apparatus; "B" shows it attached to the illuminating apparatus and the microscope. In both illustrations the condenser combination is swung out and turned aside.

(A.: $^3/_4$, B.: $^1/_2$ Full Size.)

For those of our stands which are not equipped with the ABBE illuminating apparatus we supply the following condensers and diaphragms which are specially adapted for their various purposes, viz:

a. For Stand IV^b.

1. ***Simplified Illuminating Apparatus,** No. **37.** Is a condenser system of 1,20 numerical aperture, in a sliding sleeve with centrally fixed iris-diaphragm. This apparatus gives adjustable central illumination of any degree, but not oblique light. It slips into the sleeve, fixed below the stage, by means of a bayonet joint.

Price: Marks 30.—. Code-word: **Parafuego.**

2. ***Simplified Illuminating Apparatus,** No. **38,** with swing-out condenser as well as a centrally fixed iris-diaphragm.

Price: Marks 55.—. Code-word: **Paraguas.**

In addition to the condensers with centrally fixed iris-diaphragm, specified above under 1 and 2, the cylinder-diaphragm, No. **21,** and the iris-cylinder diaphragm, No. **22,** as used with the ABBE illuminating apparatus, may also be used on Stand IV^b. But the achromatic condensers, the centring apparatus for objectives, the diaphragms for dark-ground illumination, the polarisers and the illuminating apparatus for spectroscopically decomposed light are absolutely inapplicable to Stand IV^b.

b. For Stands VI and VII.

For these stands a sliding sleeve, similar to that of Stand IV^b, but with a diameter of 20 mm only, is fitted underneath the stage.

We supply the following accessories made to fit into this particular sleeve:

1. **The Cylinder-Diaphragm** fitted with 3 stops, No. **39.**

Price: Marks 2.—. Code-word: **Paralaje.**

2. ***The Iris-cylinder Diaphragm,** No. **40.** Fig. 13.

Price: Marks 8.—. Code-word: **Paralelo.**

Side elevation and sectional view. Plan view.

Fig. 13.

Iris-cylinder diaphragm, No. 40.
(Full Size.)

In subsequent orders for the iris-cylinder diaphragm, No. 40, the factory number of the stand with which it is to be used should be stated.

3. ***Illuminating Apparatus,** No. **41,** Fig. 14, being a double-lens condenser of 1,0 numerical aperture and 6,7 mm focal length.

A small iris-diaphragm is centrally fixed to the mount of the condenser. This diaphragm, being an indispensable adjunct to this form of illuminator, is invariably supplied with it.

Price: Marks 22.—. Code-word: **Paralizar.**

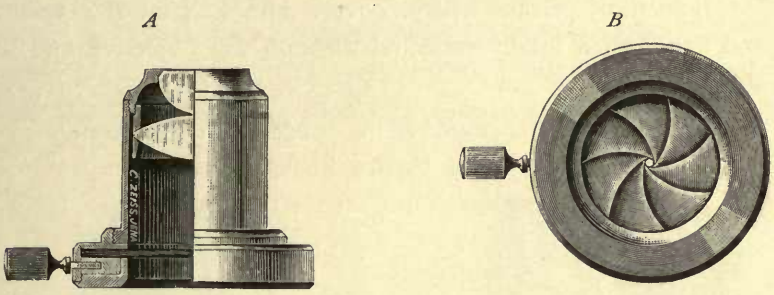


Fig. 14.
Illuminating Apparatus, No. 41.
A. Side and sectional elevation. *B.* Plan-view of the iris-diaphragm.
(Full Size.)

When subsequently ordering the illuminating apparatus, No. 41, separately, the cylinder-diaphragm belonging to the stand should be sent to us.

When in using Stands **IV^b**, **VI** *and* **VII** *oblique light is required, the condensers and sliding sleeves must be removed; the azimuth and obliquity of the light-pencil may then be varied within a fairly wide margin by appropriate manipulation of the mirror, which is movable in all directions.*

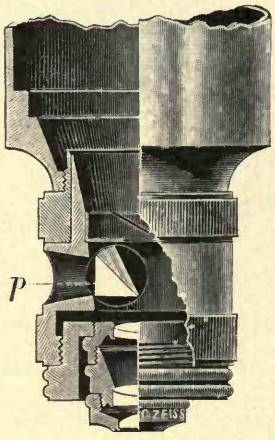
With Stands IX^a and X^a, as also with the Dissecting Stands, illumination by transmitted light only can be effected by the mirror or, when diffuse light is required, by means of white paper disks.

II. Illumination by reflected light.

In the examination of opaque objects, metal specimens, &c., an appliance for adequately lighting up the specimens from above is indispensable. If the free working distance of the objective used is very large, it generally answers sufficiently well to illuminate the object by the direct rays of daylight or

lamplight, but, if necessary, the condition of the light may be improved by means of a collective lens placed before the microscope (see under heading of Accessory Apparatus, p. 111). When, however, the available working distance is small, an appliance for passing the light through the objective becomes necessary. This requirement is met by the ***Vertical Illuminator, No. 42** (Fig. 15), supplied by us now for a considerable time past. The rays issuing from the source of light enter through a lateral opening in the mount of the apparatus, strike the hypotenuse surface of a reflecting prism, which covers one half of the aperture of the objective, and are thence totally reflected through the objective and concentrated upon the object.

Price of Vertical Illuminator: Marks 18.—. Code-word: **Paramento.**



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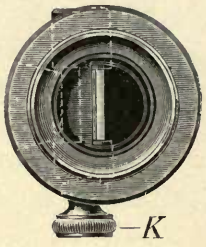


B

Fig. 15.
Vertical Illuminator, No. 42.
A: view of same (partly sectional) attached to the lower tube and the objective *C* — the latter in short mount; *p:* reflecting prism; *B:* plan view; *K:* milled knob for revolving the prism.
(Full Size.)

As it is of importance for the efficient working of the apparatus that the upper lens of the objective should be as close to the prism as possible, most objectives intended for work with a vertical illuminator should be fitted in special mounts.

Preparations under a cover-glass are not suitable for examination with the apparatus; the higher powers (apochromatic objectives from **8 mm** equivalent focus and achromatic lenses from **D** upwards) require to be specially corrected for examining uncovered objects. In working with oil immersion, on the other hand, the use of cover-glasses is again admissible.

It is furthermore of great advantage to reduce the diameter of the image of the source of light so that the illuminated portion of the object may not be greater than the area of the visible field of the objective used. The readiest means to attain this object is by placing a collective lens with iris-diaphragm in the most favourable position before the microscope.

For fuller particulars see the Directions for using the Vertical Illuminator, a copy of which accompanies each instrument supplied by us.

An illuminating appliance, No. 43, employing an incandescent lamp, by the aid of which intense light may be at once directed upon any particular point to be examined, is provided for use with Stand X^{c}, known under the designation of the Corneal Microscope. Similar appliances are also applicable to our other binocular stands (see p. 76).

Price of above-described Illuminator, No. **43,** *including 3 spare lamps: Mk. 36.—.*

Code-word: **Parangon.**

Regarding appliances for illumination, by either transmitted or reflected light, by means of a collective lens separate from the Stand or with the aid of a spherical glass flask filled with water (such as is commonly used by engravers) see pp. 110 and 111.

B. The Stage.

The **dimensions of the stages** of all our microscope stands, including dissecting stands (excepting Stand **P V**), are sufficiently large to allow of any size of object slide or carrier being used. Some of the stands are even fitted with exceptionally large stages in order to meet the requirements of microscopical examination of sections of brain matter or similar preparations.

The **opening of the stage** has in most of the stands a diameter of 33 mm ($1^{5}/_{16}$ in.) in order that the large field possessed by the objectives of long focus may be fully utilized. It may, however, be reduced by the insertion of a diaphragm (the stage diaphragm) which is supplied with each instrument.

In Stands **VI** and **VII** the diameter of the stage opening is only about 20 mm (about $^{3}/_{4}$ in.).

In the dissecting stands the size of the stage opening varies in accordance with the particular purposes for which the stands are intended.

Stands **I^{a}**, **I^{b}**, **I^{c}**, **II^{a}**, **VI^{b}** and **IX^{b}** are fitted with **revolving stages** with, in the case of Stands **I^{a}** and **II^{a}**, an arrangement for centring also. The latter is fitted to Stand **I^{c}** only when supplied in combination with the large mechanical stage or the vulcanite stage.

Mechanical Stages, i. e., mechanical means of moving the object within the plane of the stage in two directions at right angles to each other, may be fitted to Stands **I^{a}**, **I^{b}**, **I^{c}**, **II^{a}**, **IV^{a}** and **IV^{b}**.

We construct four different models of this kind of apparatus, viz:

1. The ***Large Mechanical-Stage,** No. **44,** Fig. 16. The range of the movements of this pattern of stage is 50 mm (2 in.) in one direction and 35 mm ($1^3/_8$ in.) in the other; the readings of variations in either direction are taken from scales and verniers. (See "Zeitschr. f. wiss. Mikrosk.", vol. XI, 1894, pp. 301—304.) In the latest models a **third scale and vernier** is added for recording the positions of the movable cheek-piece which secures the object slide. This arrangement facilitates the convenient use of the apparatus as a **"finder",** and the process of centring is at the same time much simplified by the addition of a **centring-glass** — an object slide having a cross ruled upon it. (For particulars see the directions for using this apparatus.)

Price: Marks 100.—. Code-word: **Paranza.**

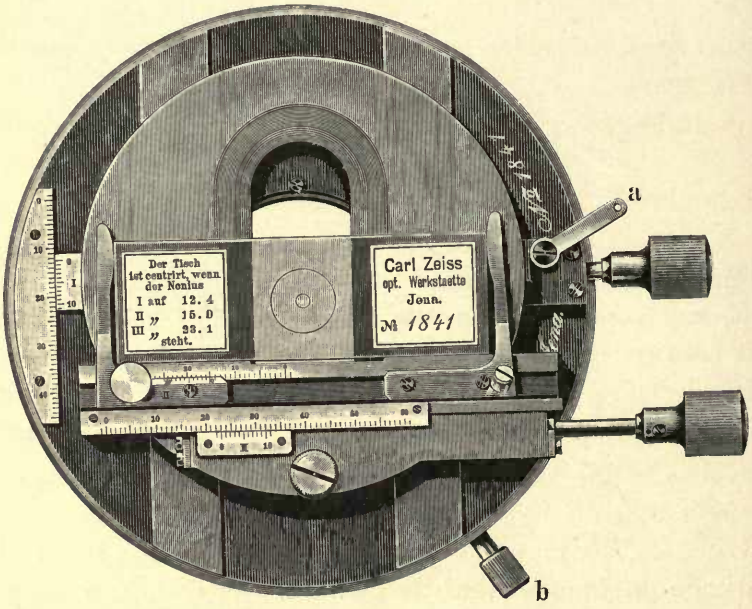


Fig. 16. Large Mechanical Stage, No. 44.
a: lever for securing the lower sliding piece; *b:* clamping screw to arrest the turning movement.

The large mechanical stage, with centring appliance, may be fitted to Stands I[a] and I[c], and an interchange of this stage for a revolving vulcanite stage, No. 45, can be effected without hindrance.

Price of Vulcanite Stage, No. **45,** *separately: Marks 25.—.* Code-word: **Parar.**

The large mechanical stage may also be fitted to Stand I[b] but, the centring appliance being omitted in that case, it cannot then be exchanged for the vulcanite stage.

2. ***Photo-micrographic Stage** (see Fig. 25, p. 55). For photo-micrographic and projection purposes it is particularly desirable to be able to impart a very slow motion to the object and simultaneously to rotate the stage round the optical axis of the microscope.

Both these requirements are met by our **photo-micrographic stage.** It has a diameter of 100 mm (4 in.) and may be moved in two directions at right angles to each other within a margin of 10 mm ($^3/_8$ in.) by means of two **con-axial milled-heads.** The amount of the movements is read by two separate scales and verniers. Having no centring appliance, this stage is not interchangeable with the large mechanical or the revolving vulcanite stages of Stand I^a, nor can it be fitted to Stand I^b.

For this reason we supply the photo-micrographic stage only in connection with Stand I^c (the Stand for Photo-micrography and Projection).

The stages specified under 1 and 2 may be fixed in any position by means of a clamping screw.

3. ***Attachable Mechanical, or Small Traversing, Stage (old pattern),** No. **46,** Fig. 17.

The construction of this stage is based in its essential features upon the principle evolved by Mr. J. MAYALL junr. (see "Journal Roy. Microsc. Soc." (2), V, 122, 1885). Two sliding pieces, mounted at right angles to, and in immediate contact with, one another, are moved by means of two milled-heads. Their various positions are recorded by scales and verniers. The range of the lateral movement is 50 mm (2 in.), that of the movement from front to rear 30 mm ($1^3/_{16}$ in.). The apparatus may also be used as a **"finder"** (see Directions for using this accessory).

Price: Marks 85.—. Code-word: **Parasito.**

Case to contain stage: Marks 5.—. Code-word: **Parazonio.**

4. ***Attachable Mechanical-Stage (new model),** No. **47,** Fig. 18.

The **milled-heads** which cause the movement of the sliding pieces are **con-axial** in this pattern of traversing stage and retain their relative positions in turning. The lateral movement may be effected with either the right hand or the left.

The margin of movement is slightly greater than with the small mechanical stage, No. **46;** the area which can be effectively searched measures about 60 × 30 mm (about $2^3/_8 \times 1^3/_{16}$ in.).

The peculiar mechanism of this stage, which was designed by Mr. MAX BERGER, the Chief of our Construction Office, guarantees a considerably greater security in the movement of the sliding pieces and fulfils all requirements of a movable stage when applied to the purposes of a **"finder".**

An accurately gauged **centring-glass**, upon which the divisions of the crossed line are marked from two edges of the slide, is supplied with each of these stages No. **47.** (See „Zeitschr. f. Instr.-Kde.", vol. XX, 1900, pp. 325—327; see also the directions for using the stage.)

Price: Marks 120.—. Code-word: **Parcial.**

Case to contain stage: Marks 5.—. Code-word: **Parcidura.**

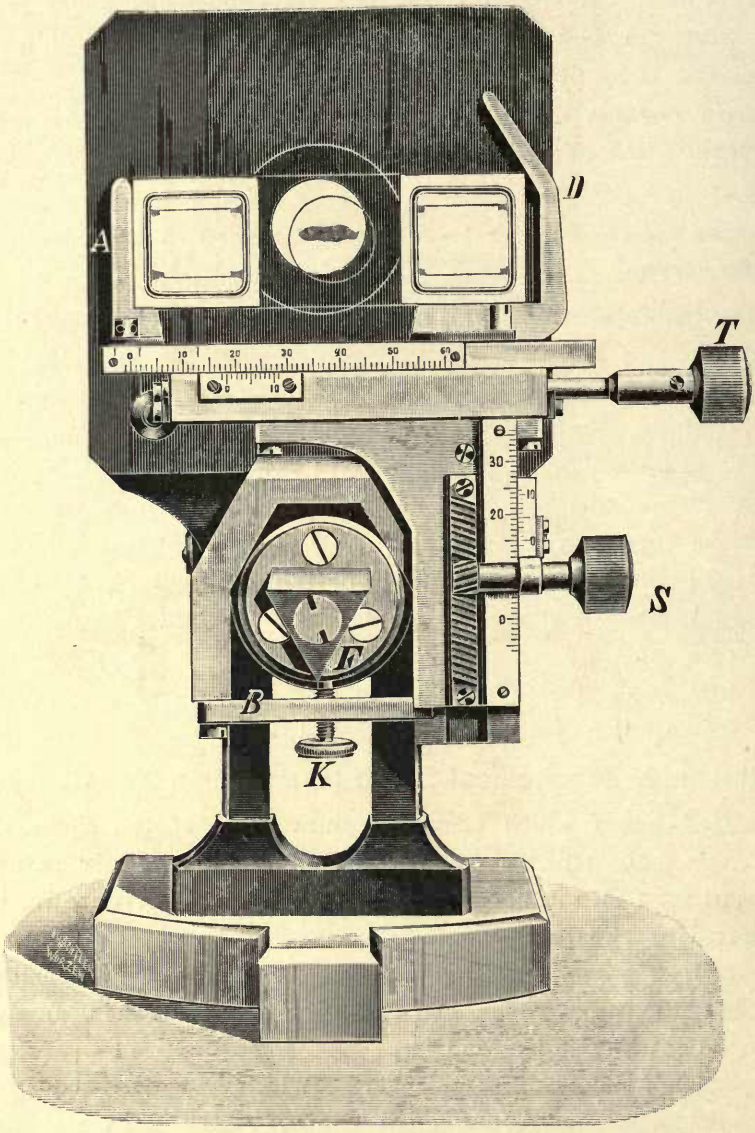


Fig. 17.
Small Mechanical Stage, No. 46, attached to Stand IV a.
(2/3 Full Size.)

The small mechanical stages specified under 3 and 4 are fastened to the prism flange of the stand (Fig. 17 and 18), they are designed for use on Stands IV^{a} and IV^{b} and can be attached to those stands without special adaptation. They may also be directly attached to Stand II^{a}, but the revolving movement of the stage is in that case suspended.

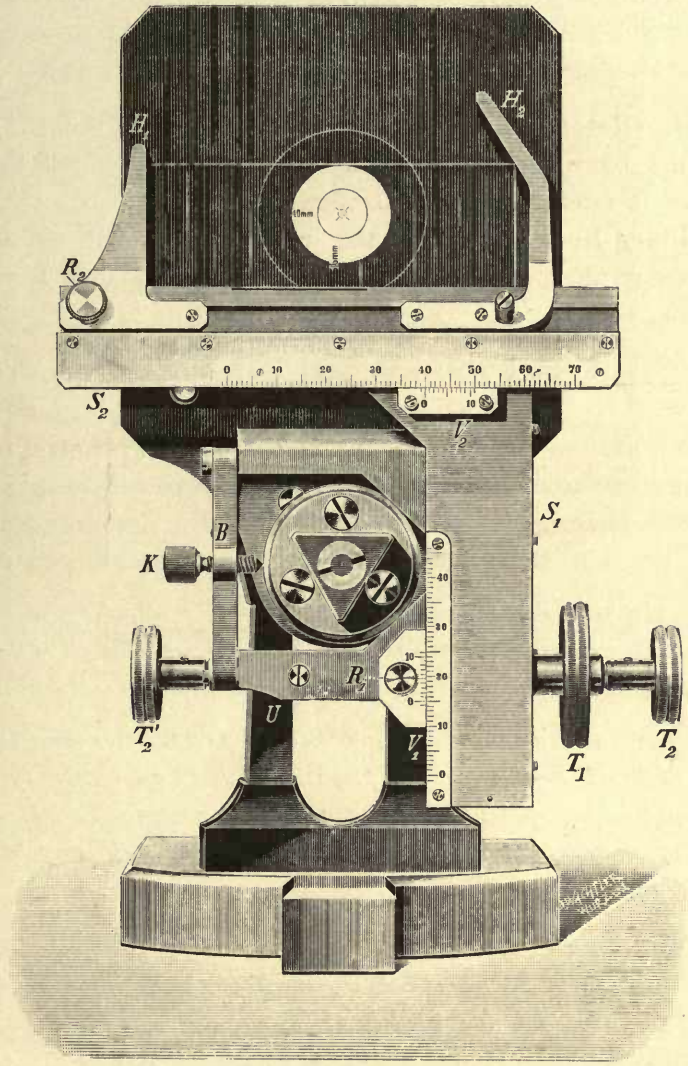


Fig. 18.

Small Mechanical Stage, No. 47, attached to Stand IV^{a}.

($^{2}/_{3}$ Full Size.)

Each of the stages specified under 1—4 is so constructed that all ordinary sizes of object-carriers may by used. The preparations are moved about on the stage platform in a similar manner as if done by hand, so that the full aperture of the condensers of the illuminating apparatus is effective.

We do not construct attachable stages for either our small or our dissecting stands. The small mechanical stage could certainly be fitted to Stand **VI**[a] by making a slight alteration, but the range of the movement of the sliding pieces would be curtailed.

The **Prism-Rotator** designed by Mr. H. S. GREENOUGH is a suitable accessory to the binocular stand **X**[a] and also to other stands having a stage aperture of 33 mm (about $1^3/_8$ in.) diameter.

The **Capillary Rotator,** constructed in accordance with the suggestions of the same designer, may be used in connection with stands having a smaller stage aperture.

(For particulars regarding the above two appliances refer to pp. 109 & 110.)

For the purpose of determining the amount of very delicate movements in one particular direction, especially where exact measurements of horizontal displacements are in question, our Stage Screw-Micrometer, No. 126, will be found useful. (Further details of this apparatus may be seen on p. 94.)

*A **very simple contrivance** for moving a counting chamber, &c., is supplied in our **Movable Stage for the Counting Chamber,** p. 98. This may also be applied to stands not adapted for the use of mechanical stages.*

*We may here also mention the so-called **MALTWOOD Finder** (see "Zeitschrift f. wiss. Mikrosk." vol. V, 1888, p. 40), which is an auxiliary appliance for refinding any particular spot in a specimen under examination. It is a "finder" appliance of the simplest description and may be used with any of our movable stages. (See p. 114.)*

C. The Focusing of the Objectives.

The coarse adjustment. The coarse adjustment of the sliding-tube type has only been retained with Stand **VII** and the Hand Microscope. Focusing by means of movement by hand is done only in the case of Dissecting Stand **P V**

and Lens Holder **L II**, all the other stands are fitted with **rack and pinion adjustment.** We have constructed special machines for the accurate production of the oblique toothgearing, and this motion is now made in such perfection that even objectives of medium power can be focused with sufficient exactness by it alone without the use of the micrometer-screw.

The fine adjustment. The micrometer movement introduced by us in 1886 (see Zeitschr. f. wiss. Mikroskopie, vol. III, 1886, pp. 207—209) has during this long period been in extensive use and has proved absolutely satisfactory. We have therefore retained it in most of our stands for the present. The superiority of this arrangement is mainly due to the fact that the force exercised by the micrometer-screw is transferred to the movable body by a single contact between two hardened steel surfaces, which ensures an extremely delicate and uniform motion.

In 1898 we introduced an entirely new type of construction of the upper part of the Stand. The coarse adjustment by means of rack and pinion was retained, **but the mechanism for fine adjustment underwent a complete change.**

The then generally used prismatic movement was discarded in favour of one by means of slides. The sliding piece itself is situated close behind the coarse adjustment action, with which it is rigidly connected by screws. It bears on its lower half an elongated nut for the micrometer-screw and above that a worm-spring the direction of whose pressure lies in the prolongation of the axis of the micrometer-screw (see Fig. 19).

A **worm-wheel,** movable by means of an **endless screw,** is situated at the lower end of the micrometer-screw and serves in a sense as a screw-head.

Here also the force exercised by the micrometer-screw is transferred to the movable body which carries the tube by a single contact between two hardened steel surfaces.

The whole mechanism, with the exception of the two milled-heads acting upon the endless screw, is enclosed inside the **crane-shaped carrier** and is thus **protected against all direct damage from outside.** An additional safety appliance prevents injury to the micrometer-screw when the sliding piece has reached the limits of its movement.

As the axes of the milled-heads used in the fine and coarse adjustment are parallel, and as in elevating and depressing the tube both turn in the same direction, the change from one movement to the other is most convenient for the hand of the operator.

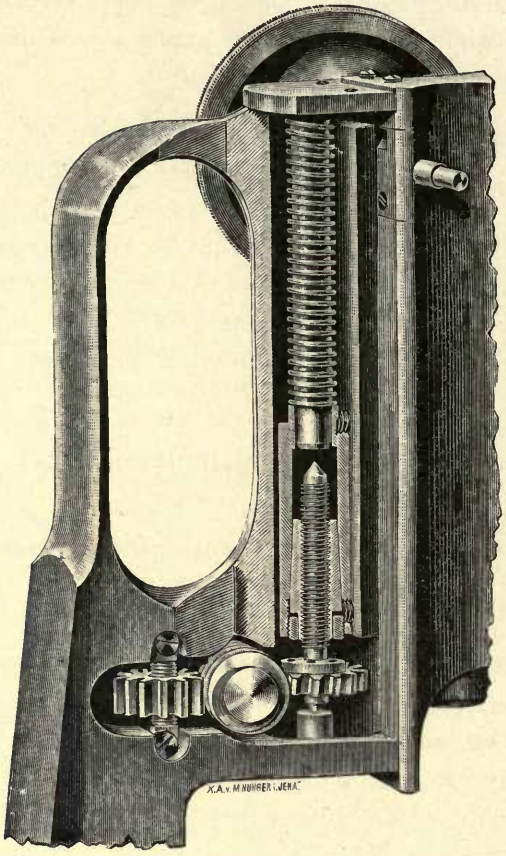


Fig. 19.

BERGER's Micrometer Movement.

(Full Size.)

A full description of this new form of micrometer movement, and of the alterations in the upper portion of microscope stands entailed by its adoption, having been contributed to the "Zeitschrift für Instrumentenkunde" (vol. XVIII, 1898, pp. 129—133) by the designer, Mr. MAX BERGER, Chief of our Construction Office, we must refer our readers to this article for detailed particulars of the construction.

The **principal advantages** of the new form of body over the old are as follows:

1. The **projection of the tube,** i. e., the distance of the axis of the tube from the column supporting the body, is sufficient to admit of objects having a diameter up to 150 mm (about 6 in.) being placed upon the stage and thoroughly examined, and this projection may be still further extended. We have, indeed, already made full use of this possibility in the construction of our so-called **Brain-section Microscope, Stand I^{d}** (Fig. 25, p. 57), the stage of which facilitates a thorough examination of objects up to 250 mm (about 10 in.) in diameter.

2. **BERGER's micrometer movement far surpasses the old in delicacy,** is also free from excessive one-sided weight, and is provided with safety appliances which almost entirely exclude the chances of accidental injury.

3. The **most natural place for grasping** the microscope for purposes of removal is by the **column supporting the upper body.** By the new form of construction we were enabled to convert the upper portion of this column into a **convenient handle,** while an attempt to lift a microscope of the old type in the same manner would most likely have resulted in damage to the prismatic movement as well as to the micrometer-screw.

The **divisions on the milled-head** of the old type of micrometer movement, as applied to our large and medium stands, enables one to read movements of 0.005 mm of the tube in the direction of the optical axis. **One of the milled-heads of BERGER's micrometer movement** is also provided with a **divided scale,** each division of which corresponds to a **variation of 0.002 mm in the position of the tube.**

By means of above **measurements of thickness** may be made with a considerable degree of accuracy. The upper and lower surfaces of the object are successively focused and the respective positions of the index read off on the divisions of the milled-head. The difference between the two readings — objectives of the dry series being used — then represents the thickness of an object in air.

If the refractive index of the object be known, its actual thickness may be approximately ascertained by means of this also. In the reverse way, the refractive index of an object may also be approximately determined if its thickness be known. Assuming d = the difference between the two readings, D = the actual thickness of the object, and n = its refractive index, then — although approximately only — the formula

$$D = n\,d.$$

holds good.

In, for instance, estimating the thickness of a cover-glass, n may be assumed to be equal to 1.5 without risk of appreciable error.

In taking measurements of this kind it is best to use one of the higher dry lenses and a medium eye-piece, using central illumination.

With regard to the execution of more exact measurements of thickness by the aid of the micrometer-screw see an article by S. CZAPSKI on "Die Bestimmung von Deckglasdicken an fertigen Präparaten" (Zeitschr. f. wiss. Mikrosk. vol. V, 1888, pp. 482—484).

The draw-tube which is possessed by all stands, with the exception of Stands **IX** and **X** and the Hand-microscope, admits of the **tube-length** (see p. 3) being increased or diminished. With Stands **I** to **IV** the length of the tube may be read off on the scale engraved upon it. The lower end is provided with the standard screw to take an objective of lower power, as, for instance, the auxiliary objective used with the apertometer.

The **internal diameter of our draw-tube** is 23.3 mm at **the eye-piece end.**

D. Appliances for Changing the Objectives on the Stand.

Revolving Nose-pieces or **Sliding Objective-changers** are appliances designed to facilitate the rapid and commodious interchange, while interfering as little as possible with the focusing and centring, of the objectives.

The sliding objective changers are in so far superior to the revolving nose-pieces that they admit of the maintenance of the focusing and centring with much greater exactness than the latter are ever capable of giving. Another advantage is that in using them the number of objectives is not restricted to any particular limit.

Respecting the elongation of the tube produced by the adaptation of these appliances see the remarks on page 3.

1. **Revolving nose-pieces,** Nos. **48—50,** Fig. 20. A clamping ring with milled edge serves to fix the nose-piece in any desired position — as a rule so as to have the objectives not in actual use turned symmetrically towards the front. The objectives are screwed into the nose-piece and can by a simple turn be placed in rapid succession in alignment with the tube, the correct position being indicated by the snapping of a spring.

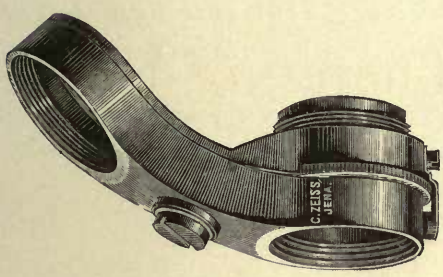
A curved cover, turned by special methods of our own, fits closely over the openings into which the objectives are screwed and protects them against dust.

We supply revolving nose pieces to receive 2, 3 and 4 objectives.

When using a revolving nose-piece with Stand **VII**, a **Clamping ring, No. 51** will be found desirable (p. 66).

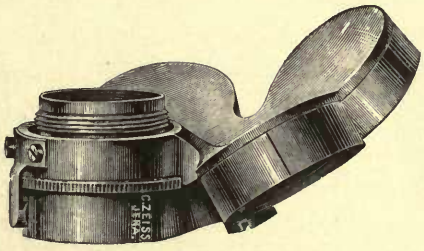
	Price:	Code-words:
Double Revolving Nose-pieces, No. **48**	*Marks* 20.—.	**Pardal.**
Triple „ „ „ **49**	„ 27.—.	**Pardina.**
Quadruple „ „ „ **50**	„ 32.—.	**Pardogris.**
Clamping ring, No. **51**, *for Stand* **VII**	„ 3.—.	**Pared.**

Fig. 20.



Revolving Nose-piece, No. 48, for 2 objectives.

Revolving Nose-piece, No. 49, for 3 objectives.



Revolving Nose-piece, No. 50, for 4 objectives.
(Full Size.)

2. ***Sliding objective-changers,** Nos. **52** and **53**, Fig. 21. This apparatus is so arranged that the observer himself may centre each separate objective and it admits of the use of an unlimited number of objectives.

The **tube-slide,** No. **52**, Fig. 21[a], is screwed on the end of the body like an ordinary revolving nose-piece and may be secured with the slide action either pointing to the front or turned sideways.

The plane of the tube-slide is inclined to the axis of the tube at an angle of about 84°. The plane of the **objective slide**, No. **53**, is inclined at a corresponding angle so that, on being withdrawn, the objective moves slightly away from the specimen. A screw — turned by a watch key — serves as a centring adjustment in the direction of the slide, while an endless screw (at right angles to the first-mentioned and, like it, regulated by a watch key) effects the centring of the objective at right angles to the slide.

Objectives having their mounts so adjusted as to be approximately in focus when changed can also, by means of the screw-collar on the objective slide, be accurately focused and then permanently fixed in their proper position by a counterscrew-collar.

We are prepared, at request, to adjust with the greatest care several objectives used on a revolving nose-piece or with sliding objective-changers to one focal plane, with the exception of all Immersion systems and the achromatic Objectives **a_0—aa**, *but we must expressly remark that this adjustment is accurate only when the correct tube-length is maintained.*

Tube-slide, No. **52** . . . . . *Price: Marks* 10.—. Code-word: **Pareja.**
Objective-slides, No. **53**, *each* . . . „ „ 10.—. „ **Parental.**

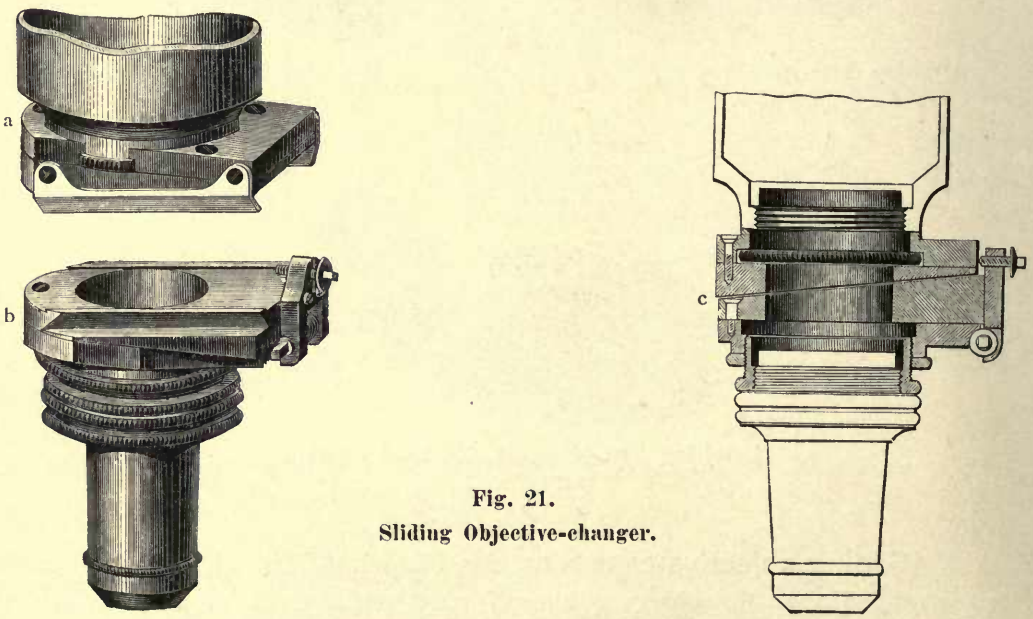


Fig. 21.
Sliding Objective-changer.

a: tube-slide; b: objective-slide with objective attached; c: intersection.

(Full Size.)

For the better preservation of objectives with slides attached to them we supply, if desired, special cases of various sizes. (See Fig. 22.)

	Price:	Code-words:
Leather case for 3 objective-slides and objectives, No. **54**	*Marks 6.—.*	**Parhilera.**
Mahogany „ „ 6 „ „ „ with lock and key, No. **55**	„ *15.—.*	**Parida.**

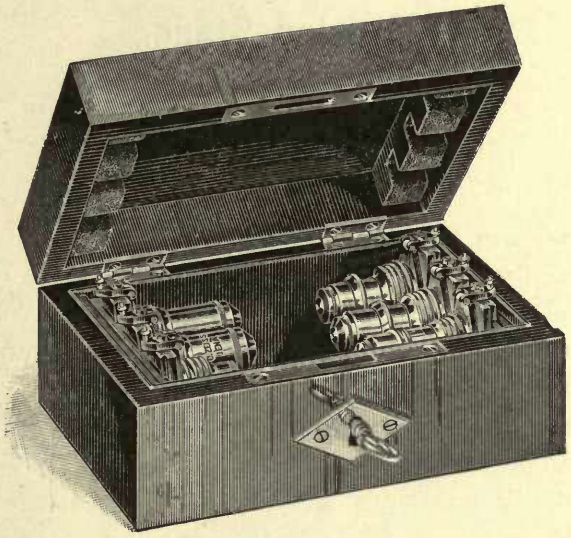


Fig. 22.

Mahogany case for 6 Objective-slides and Objectives, with lock and key, No. 55.

($^1/_2$ Full Size.)

E. Various Models of Stands.

Monocular Stands.

Large Stands.

All large stands are fitted with the ABBE illuminating apparatus, so that any condensers, diaphragms &c., which the sliding sleeve of that illuminator will take, can be used in connection with them (see p. 28—33). The coarse focusing is effected by means of rack and pinion movement. The upper body is inclinable from the vertical to the horizontal position of the tube.

The mirror is easily removable and has a separate sliding movement in the direction of the optical axis.

We supply the large stands with four different patterns of upper body, viz:

Stand I^a.

Upper body with old form of fine adjustment; solid outer tube; draw-tube adjustable in sliding sleeve.

A. with **revolving, centring vulcanite stage,** No. **45** (diameter 120 mm = $4^3/_4$ in.).

		Price:	Code-words:
No. **56**:	*Stand* **I^a** *with vulcanite stage and ordinary condenser, num. Ap. 1.40:*	*Marks 300.—.*	**Pariente.**
„ **57**:	*Stand* **I^a** *with vulcanite stage and swing-out condenser, num. Ap. 1.40:*	„ *325.—.*	**Parietale.**

B. with **large mechanical stage,** No. **44**, Fig. 23.

„ **58**:	*Stand* **I^a** *with large mechanical stage and ordinary condenser, num. Ap. 1.40:*	*Marks 375.—.*	**Parizon.**
„ **59**:	*Stand* **I^a** *with large mechanical stage and swing-out condenser, num. Ap. 1.40:*	„ *400.—.*	**Parlador.**

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

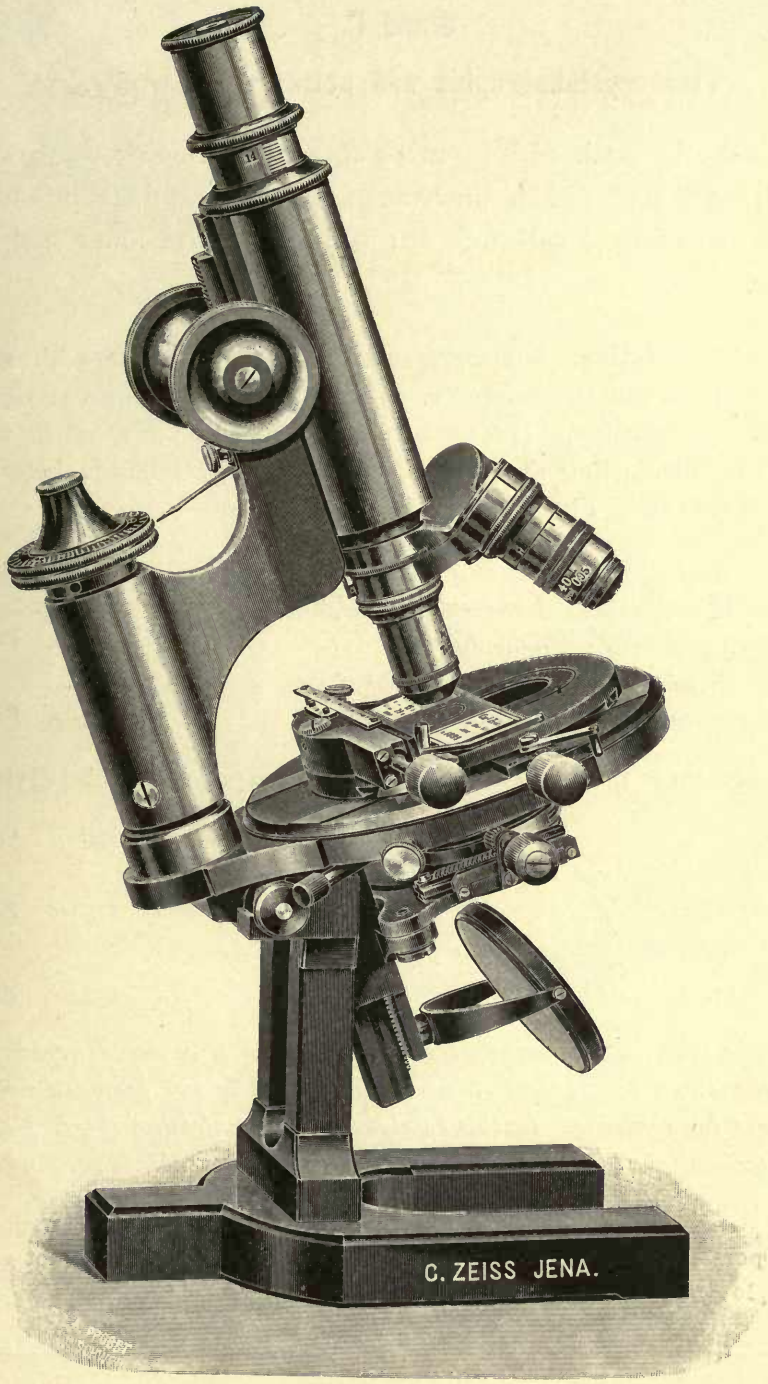


Fig. 23.
Stand I^{a} with large mechanical stage.
($^{1}/_{2}$ Full Size.)

Stand I^{b}

(for crystallographic and petrographic work).

Upper body with old form of fine adjustment; draw-tube fitted with rack and pinion movement; several openings in outer tube; with centring appliance for objectives on lower end of outer tube.

A. with **rotating, but permanently centred, stage** with **graduated scale** at the circumference, and **auxiliary cross-lines** at right angles to one another. The permanent centring of the stage in relation to the illuminating apparatus is most carefully adjusted before leaving our works. Fig. 24.

		Price:	Code-words:
No. **60**:	*Stand* **I^{b}** *with rotating, permanently centred stage and ordinary condenser, num. Ap. 1.40*	*Marks 500.—.*	**Parlanchin.**
„ **61**:	*Stand* **I^{b}** *with rotating, permanently centred stage and swing-out condenser, num. Ap. 1.40*	„ *525.—.*	**Parlerito.**

B. with **large mechanical stage** which is also provided with a **divided scale.**

		Price:	Code-words:
No. **62**:	*Stand* **I^{b}** *with large mechanical stage and ordinary condenser, num. Ap. 1.40*	*Marks 575.—.*	**Parnasso.**
„ **63**:	*Stand* **I^{b}** *with large mechanical stage and swing-out condenser, num. Ap. 1.40*	„ *600.—*	**Parola.**

The tube of Stand **I^{b}** *being already fitted with a centring arrangement for objectives, the large mechanical stage of that stand is not provided with a separate appliance for centring. In this combination the vulcanite stage, No.* **45**, *and the large mechanical stage are therefore not interchangeable.*

With the swing-out condenser, num. Ap. 1.40, as supplied with Stand I^{b}, the two upper lenses are easily removable, as their mount slips (not screws) on that of the lower lens.

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

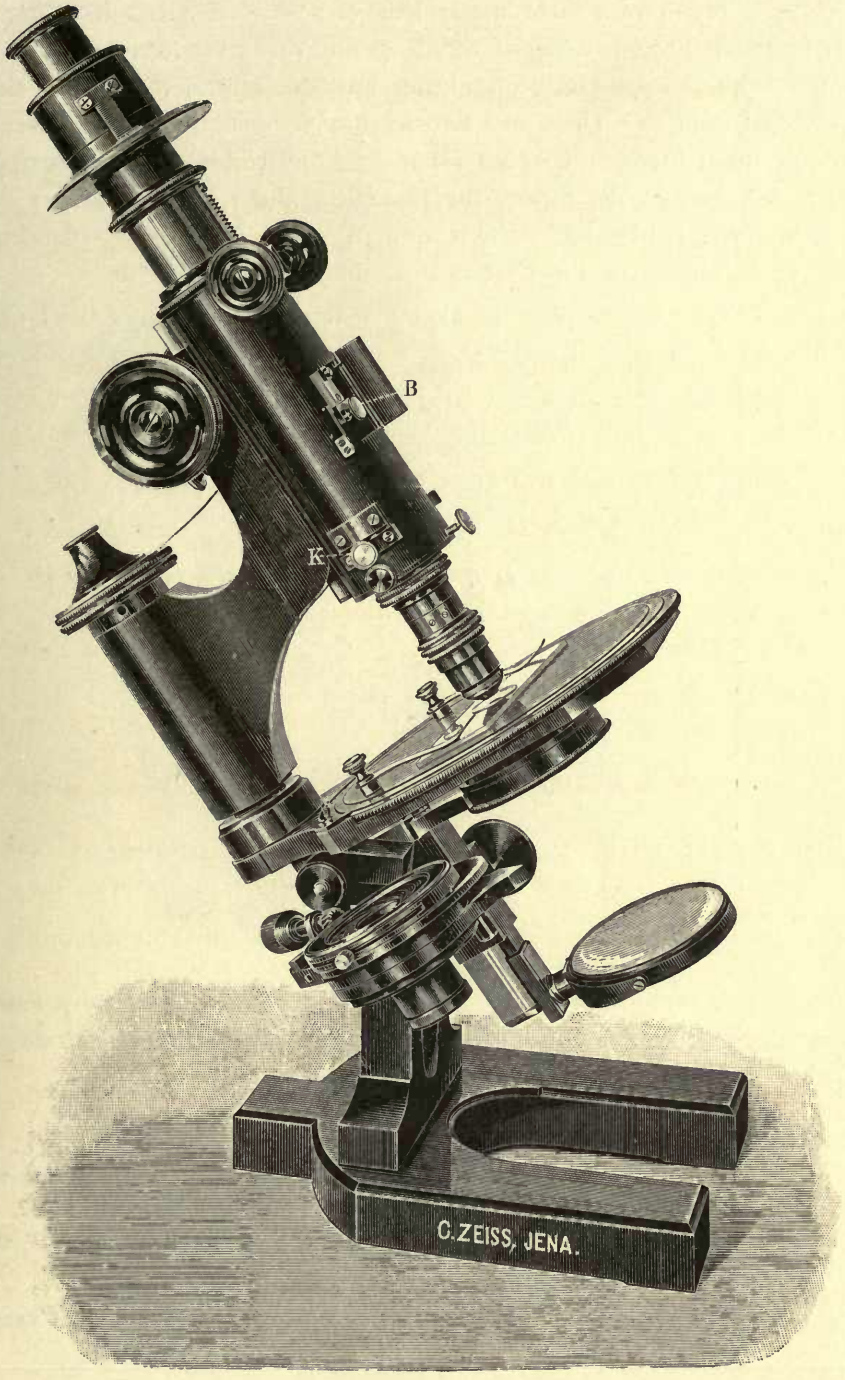


Fig. 24.
Stand I^{b} (large Mineralogical Stand).
($^{1}/_{2}$ Full Size.)

The draw-tube of Stand **I^b** carries on its lower extremity a slide for the reception of a low-power achromatic lens (a so-called **AMICI-BERTRAND lens**), which is inserted through a flap-covered opening in the outer tube. This lens, in combination with the eye-piece, constitutes an auxiliary microscope for the observation of axial images. There are two additional openings in the lower portion of the outer tube; in one of which slides a light-excluding fitting carrying the analyzer (not shown in the figure) **for insertion above the objective;** the other admits a second slide for various **quartz plates** serving to determine the directions of extinction or the character of the double refraction.

A BIOT-KLEIN quartz plate, as also a selenite film for red of the I. Order and a mica film $^1/_4\ \lambda$, in special settings, which fit into one of the openings of the slide mentioned, are always given with Stand **I^b**. Other selenite or mica films, similarly mounted, are immediately interchangeable for the crystal plates referred to.

In addition to the analyzer above the objective, a polarizer and an analyzer with scale (for insertion above the eye-piece) are supplied with Stand **I^b**.

The objective combinations **a_0** *and* **a_1** *cannot be used on Stand* **I^b**.

Stand I^c

(for photo-micrography and projection).

Upper part with BERGER's micrometer movement; very wide body tube; draw-tube adjustable in sliding sleeve. The tube-column is strongly fitted and shaped so as to form a convenient handle. Fig. 25.

This stand, though primarily designed for photo-micrography and projection, **may nevertheless be used with equal advantage for visual observation in all other ordinary microscopic work.**

A. with **revolving, centring vulcanite stage, No. 45.**

		Price:	Code-words:
No. **64**:	*Stand* **I^c** *with vulcanite stage and ordinary condenser, num. Ap. 1.40*	*Marks 325.—*.	**Parotida.**
„ **65**:	*Stand* **I^c** *with vulcanite stage and swing-out condenser, num. Ap. 1.40*	„ *350.—*.	**Parpasola.**

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

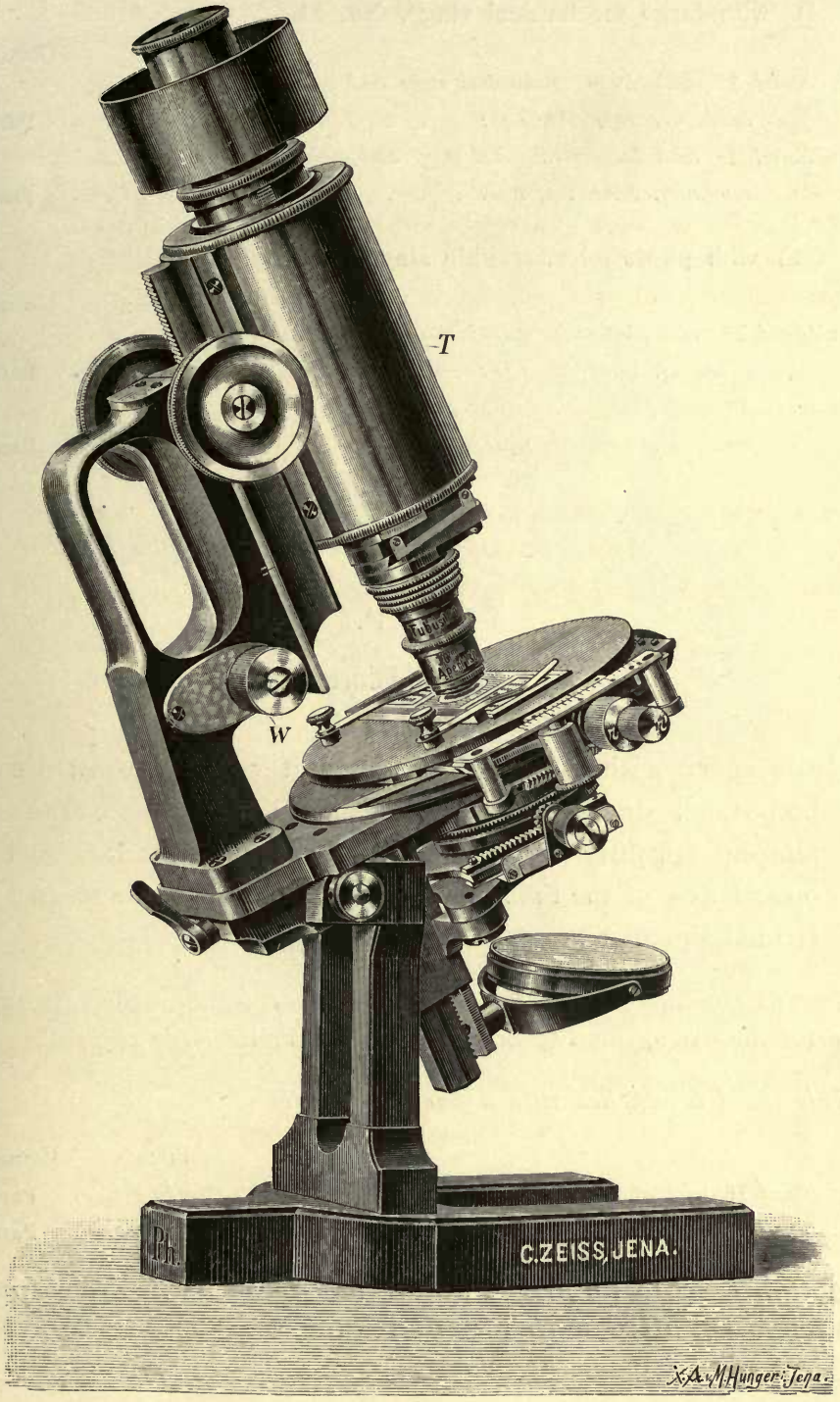


Fig. 25.

Stand Ic (for photo-micrography and projection), with photo-micrographic stage.

(1/2 Full Size.)

B. with **large mechanical stage, No. 44.**

		Price:	Code-words:
No. **66**:	*Stand* **I^c** *with large mechanical stage and ordinary condenser, num. Ap. 1.40:*	*Marks 400.—.*	**Parrafo.**
„ **67**:	*Stand* **I^c** *with large mechanical stage and swing-out condenser, num. Ap. 1.40:*	„ *425.—.*	**Parrilla.**

C. with **photo-micrographic stage** (p. 39), fig. 25.

		Price:	Code-words:
No. **68**:	*Stand* **I^c** *with photo-micrographic stage and ordinary condenser, num. Ap. 1.40:*	*Marks 400.—.*	**Parroquia.**
„ **69**:	*Stand* **I^c** *with photo-micrographic stage and swing-out condenser, num. Ap. 1.40:*	„ *425.—.*	**Parte.**

Stand I^d.

(Brain-section Microscope.)

Upper-part with BERGER's micrometer movement; very wide body-tube; draw-tube adjustable in sliding sleeve; the crane-shaped supporting pillar projects unusually far, so that the optical axis of the tube coincides with the centre of a stage 250 mm (10 in.) square. Fig. 26.

The extraordinary size of the stage of this stand renders it eminently suitable for the examination of brain-sections or similar large objects.

This stand is supplied with a fixed stage only.

		Price:	Code-words:
No. **70**:	*Stand* **I^d** *with ordinary condenser, num. Ap. 1.20:*	*Marks 355.—.*	**Partero.**
„ **71**:	*Stand* **I^d** *with swing-out condenser, num. Ap. 1.20:*	„ *380.—.*	**Partible.**

A light-excluding fitting and 3 adapters for the micro-planars are always supplied with Stands I^c and I^d.

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-prices.

Suitable complete specifications are appended at the end of this catalogue.

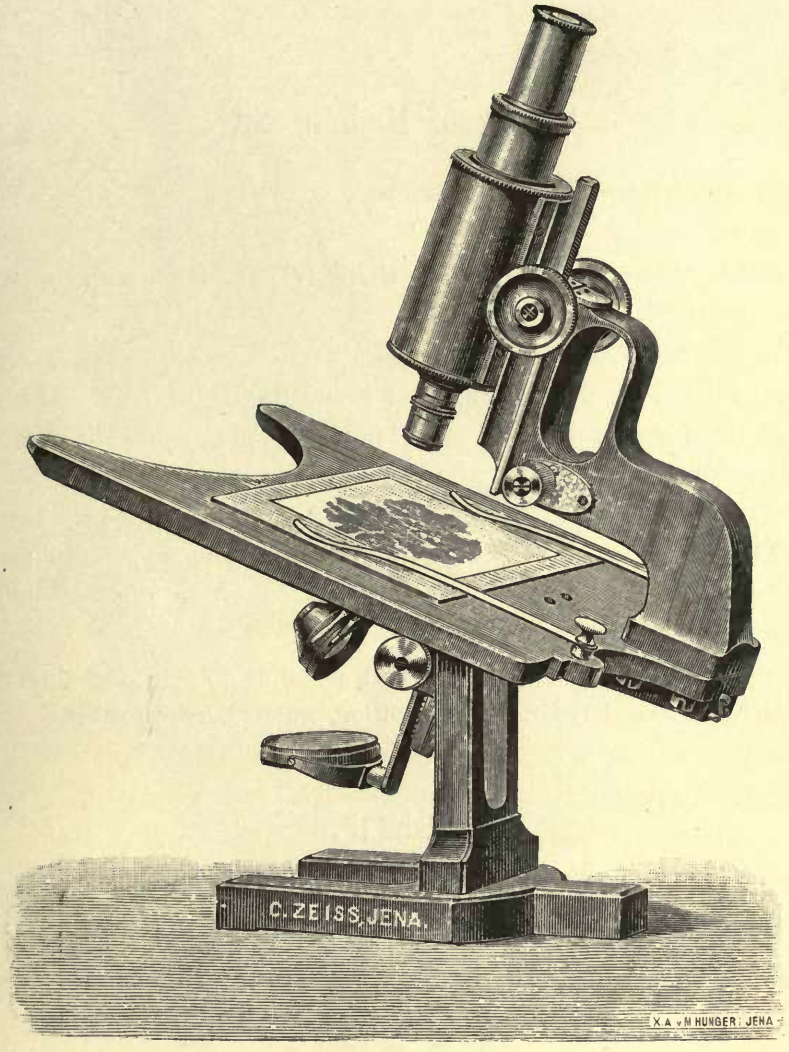


Fig. 26.
Stand Id for examining Brain-sections.
($^1/_3$ Full Size.)

Stands of Medium Size.

All stands of medium size, except Stand **IV^b**, are fitted with the ABBÉ illuminating apparatus.

The upper body is inclinable from the vertical to the horizontal position of the tube; fitted with the **old form of fine adjustment** only. The coarse adjustment of the focus is effected by means of rack and pinion. The draw-tube slides in and out of a sleeve.

The distance between the stage and the horseshoe-shaped base being slightly less than with the large stands, some of the illuminating appliances described on pp. 30—32 can only be used in the inclined position of the stands. (See remarks on p. 32.)

The mirror is easily removable and is adjustable in the direction of the optical axis; with Stand **IV^b** it is, in addition, universally movable.

Stand II^a.

This stand has a **revolving, plain vulcanite stage,** provided with a **centring appliance** and having a diameter of 100 mm (4 in.). Fig. 27.

Since it is fitted with a revolving stage, this is the only one of the medium stands adapted for working with polarized light.

For the purpose of **observing axial images** it is best to use the objective combination **a$_2$**, which screws into the threads of the draw-tube.

	Price:	Code-words:
No. **72:** *Stand* **II^a** *with ordinary condenser, num. Ap. 1.40:*	*Marks* 290.—.	**Participar.**
„ **73:** „ **II^a** „ *swing-out* „ „ „ „ „	315.—.	**Particular.**

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

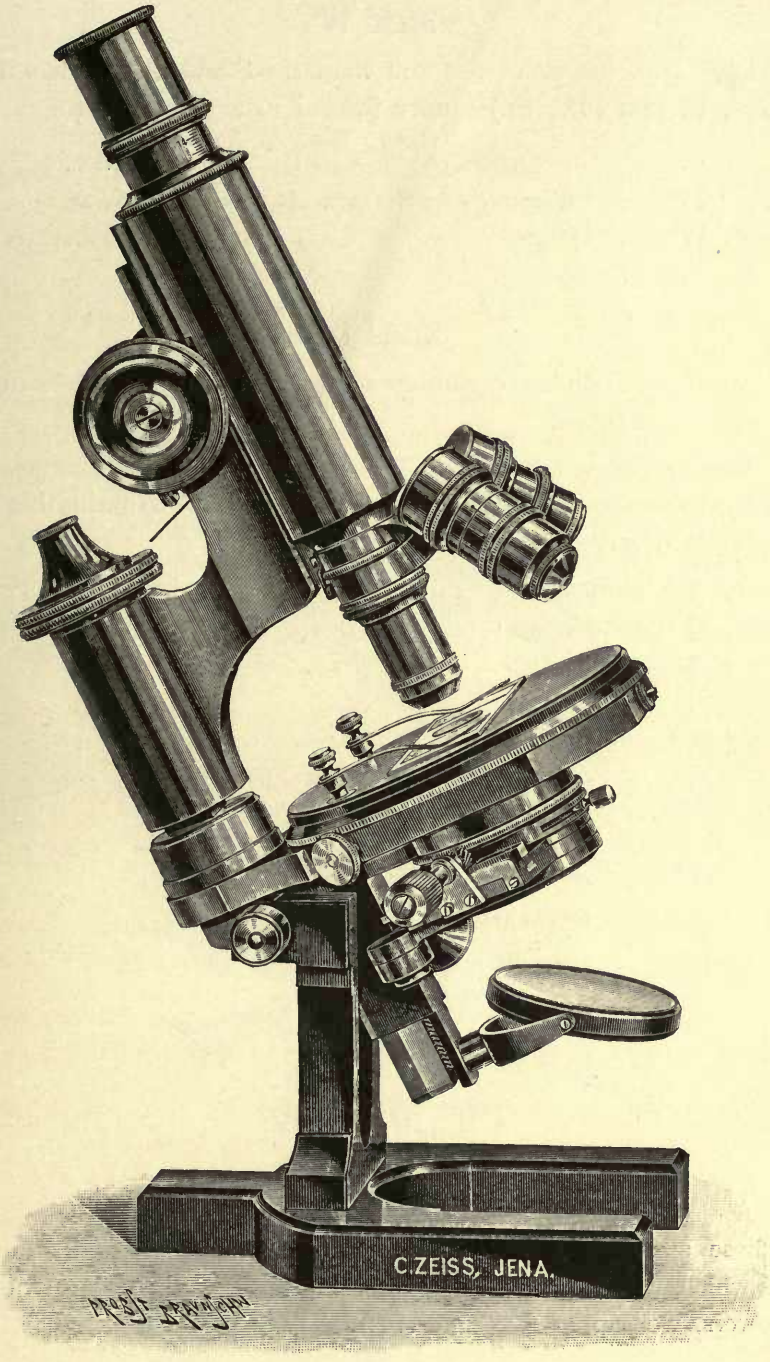


Fig. 27.
Stand II[a].
(1/2 Full Size.)

Stand IV[a].

Stand **IV[a]** is of the same size and shape as Stand **II[a]**, but has a **fixed vulcanite stage, 90 mm (3 1/2 in.) square** instead of a revolving stage. Fig. 28.

	Price:	Code-words:
No. **74:** *Stand* **IV[a]** *with ordinary condenser, num. Ap. 1.20*	*Marks 250.—.*	**Partidora.**
„ **75:** *Stand* **IV[a]** „ *swing-out* „ „ „ „	„ *275.—.*	**Partir.**

Stand IV[b].

This stand is of similar construction to Stand **IV[a]**, but without the ABBE illuminating apparatus.

The illumination may be effected either by means of the universally movable mirror, without the use of condensers, or the **simplified illuminating apparatus,** Nos. **37** and **38,** described on p. 34, may be used.

In using the latter apparatus only central illumination is possible. If oblique light be required, the condenser with iris-diaphragm and their special sliding sleeve must be removed.

	Price:	Code-words:
No. **76:** *Stand* **IV[b]** *with ordinary cylinder-diaphragm, No.* **21:**	*Marks 174.—.*	**Partoral.**
„ **77:** „ **IV[b]** „ *Iris-cylinder diaphragm, No.* **22** .	„ *184.—.*	**Parvula.**
„ **78:** „ **IV[b]** „ *simplified illuminating apparatus (condenser of 1.20 num. Ap.), No.* **37** .	„ *200.—.*	**Pasable.**
„ **79:** „ **IV[b]** „ *simplified illuminating apparatus (swing-out condenser, num. Ap. 1.20), No.* **38**	„ *225—.*	**Pasadillo.**

Small Stands.

Of these small stands, which are principally intended for laboratory purposes and which, with the exception of Stands **IX**, still admit of the use of the highest powers, we supply five different models.

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

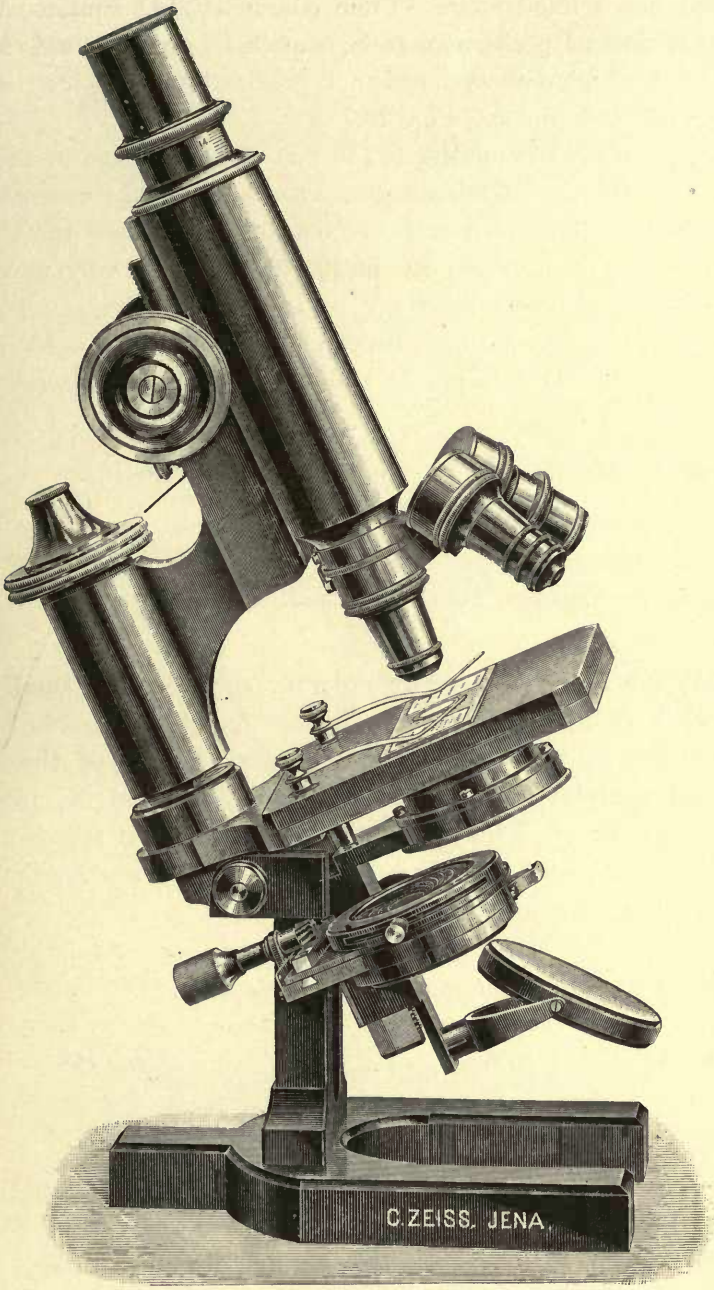


Fig. 28.
Stand IV a.
($^1/_2$ Full Size.)

Stand VI[a].

This stand has a fixed stage 80 mm (about $3^1/_4$ in.) square. Upper body inclinable to horizontal position of tube; supplied only with **old form of fine adjustment;** head of micrometer-screw not provided with divided scale; coarse adjustment by rack and pinion. Fig. 29.

The tube, when fully extended, is 160 mm ($6^1/_4$ in.) long; in the absence of a millimetric scale the correct tube-length, when a revolving nose-piece is being used, is indicated by a line cut round the outside of the draw-tube.

The illumination is obtained by means of the universally movable mirror. The sliding sleeve fixed below the stage by a bayonet joint is adapted for the cylinder-diaphragm, No. **39,** and the iris-cylinder diaphragm, No. **40,** but the illuminating apparatus, No. **41** (see pp. 34 and 35) may also be inserted.

	Price:	Code-words:
No. **80:** *Stand* **VI[a]** *with cylinder-diaphragm No.* **39** .	*Marks 130.—.*	**Pasage.**
„ **81:** „ „ „ *iris-cylinder* „ „ **40** .	„ *136.—.*	**Pasamano.**
„ **82:** „ „ „ *illuminating apparatus, No.* **41**	„ *150.—.*	**Pasapan.**

Owing to its compactness **Stand VI[a]** is particularly suitable for a **Travelling Microscope.**

We supply the stand, if specially ordered, enclosed in a **small leather or canvas case with shoulder-sling.** As it was found practicable to substitute aluminium for some of the brass parts, the **total weight of the stand with complete optical equipment** (4 objectives, 3 eye-pieces) and the most indispensable specimen utensils, also **including the case,** has been reduced to between **3** and **4 kg.** (about $6^1/_2$—**9** lbs.). (For additional details see special prospectus relating to travelling microscopes.)

	Price:	Code-word:
No. **83:** *Stand* **VI[a]** *with illuminating apparatus, No.* **41,** *in leather or canvas case instead of mahogany cabinet*	*Marks 158.—.*	**Pasaporte.**

Stand VI[b].

Stand **VI[b]** corresponds in shape and size to Stand **VI[a]** but is fitted with a revolving stage bearing a graduated scale on its circumference. There is also a centring appliance for objectives situated on the lower extremity of the tube.

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

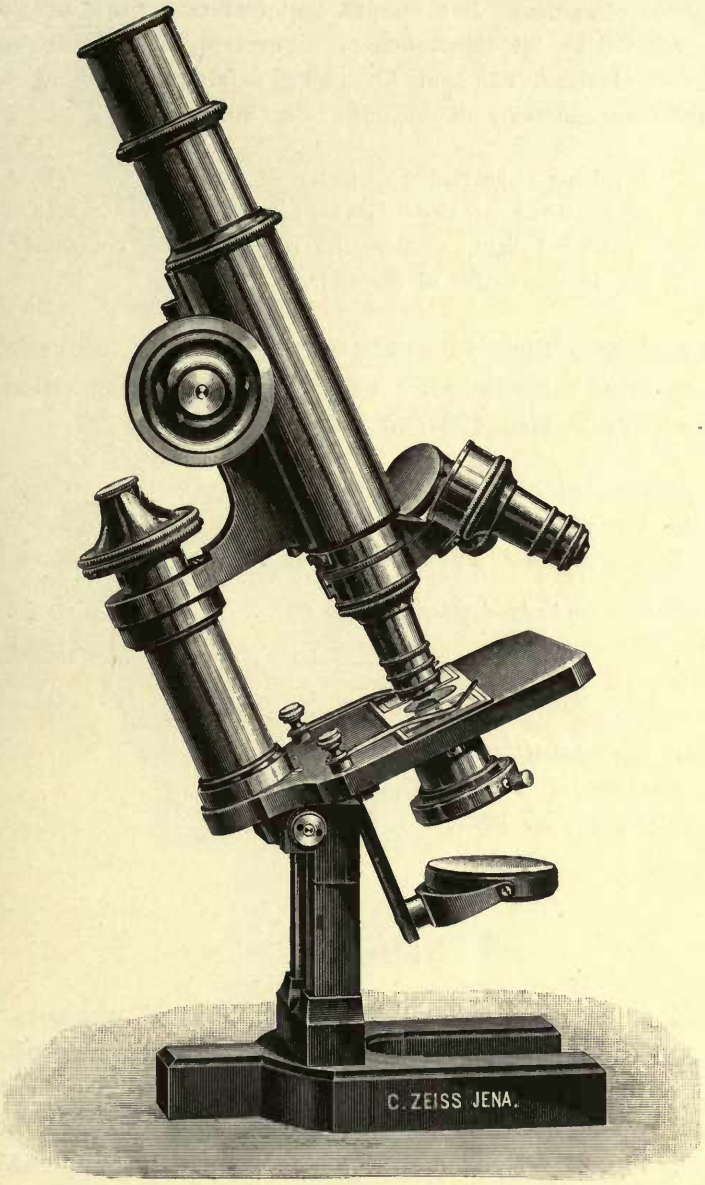


Fig. 29. Stand VI^{a}.

($^{1}/_{2}$ Full Size.)

This form of stand has only recently been introduced by us. The small Stands **VI^a** and **VII** are not fitted with revolving stages and are therefore not adapted for work with polarized light. For this reason it was deemed desirable to produce another small stand which, unlike Stand **VI^a**, should not merely admit of **the use of the highest objectives, but should also facilitate work by polarized light.** This object was attained by the substitution of a **revolving stage with engraved scale** for the fixed stage of Stand **VI^a** and by adding a **simple centring appliance for objectives** at the lower extremity of the tube. Fig. 30.

Although the revolving stage has a diameter of about 80 mm (about $3^1/_4$ in.), still, it is advisable to use slides of the "Giessen" pattern (48×28 mm $= 2 \times 1^1/_8$ in.) when working with polarized light, so that the stage may be completely revolved even when the object is not in the centre of the slide.

Selenite and Mica films in special settings may be conveniently inserted between eye-piece and analyzer when using Stand **VI^b** in connection with one of the polarizing apparatus, Nos. **173** and **174** (see p. 103).

For the purpose of observing axial images it is best to use objective **a_2**, screwed into the thread at the lower end of the draw-tube.

		Price:	Code-words:
No. **84:**	*Stand* **VI^b** *with cylinder-diaphragm, No.* **39** . . .	*Marks 160.—.*	**Pasavino.**
„ **85:**	„ „ „ *iris-cylinder* „ „ **40** . . .	„ *166.—.*	**Pascua.**
„ **86:**	„ „ „ *illuminating apparatus, No.* **41** . .	„ *180.—.*	**Paseo.**
„ **87:**	„ „ „ *polarizing apparatus, No.* **174** *and selenite film for red of the I. Order, No.* **182** *(incl. cylinder-diaphragm, No.* **39***)*	„ *208.—.*	**Pasilargo.**

Stand VII.

The **fixed stage** of this stand is rectangular and measures 63×70 mm ($2^1/_2 \times 2^3/_4$ in.). The upper body, which is not inclinable, is fitted with the **old form of fine adjustment.** The head of the micrometer screw has no scale engraved on it. The coarse adjustment is gained by sliding the tube in or out of a sleeve. Fig. 31. Rack and pinion movement not applicable. Illuminating and diaphragm appliances the same as with Stand **VI^a.**

The prices quoted above include only the stands in mahogany cabinets, without oculars, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

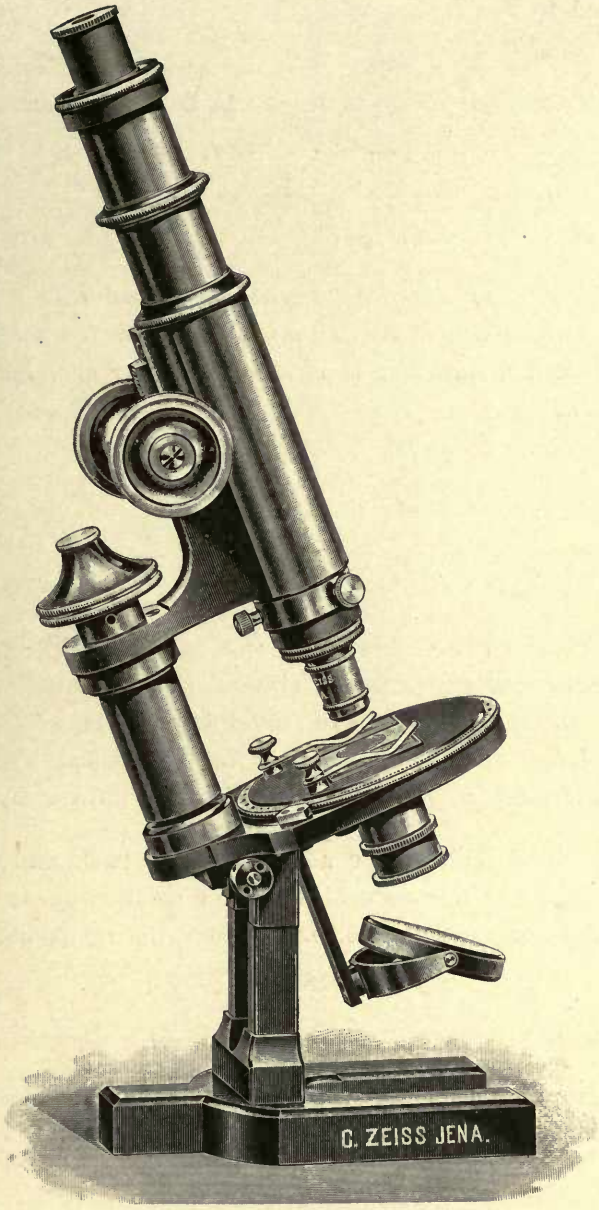


Fig. 30.
Stand VI^{b} with Polarizing Apparatus, No. 174.
($^{1}/_{2}$ Full Size.)

When using a revolving nose-piece with this stand a **clamping-ring,** No. **51** (p. 47), will be found desirable. This will prevent the tube from slipping down in consequence of the additional weight of the nose-piece and 2 or 3 objectives attached to it.

	Prices:	Code-words:
No. **88**: *Stand* **VII** *with cylinder-diaphragm, No.* **39** . .	*Marks 80.—.*	**Pasionero.**
„ **89**: „ „ „ *iris-cylinder diaphragm, No.* **40**	„ *86.—.*	**Pasivo.**
„ **90**: „ „ „ *illuminating apparatus, No.* **41** .	„ *100.—.*	**Pasmazon.**
Tube-clamping-ring, No. **51**	„ *3.—.*	**Pared.**

Owing to insufficient distance between stage and tube a revolving nose-piece cannot be used on Stand **VII** *in conjunction with the lower-power objectives from* a_0 *to* **aa** *inclusive, and sliding objective-changers are, for the same reason, entirely inapplicable.*

Stand IX^a.

This stand is primarily designed for use as an **auxiliary in the laboratory and for technical purposes.** The tube is not fitted with a draw-tube, nor is the upper body inclinable. Its fixed circular stage (100 mm = 4 in. in diameter) has a large opening which may be diminished by the use of a diaphragm. Its combined plane and concave mirror is universally movable.

Stand **IX^a** is fitted with **coarse adjustment by rack and pinion only,** and the construction admits of the convenient use of medium-power objectives having numerical apertures not exceeding 0.65. See Fig. 32 on p. 69.

	Price:	Code-word:
No. **91**: *Stand* **IX^a**	*Marks 50.—.*	**Pasquin.**

Stand IX^a is particularly well adapted for examining opaque objects, rock and metal specimens, &c., with low magnifications while using the vertical illuminator.

For particulars regarding the use of the vertical illuminator see p. 36.

The prices quoted above include only the stands in mahogany cases, without eye-pieces, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

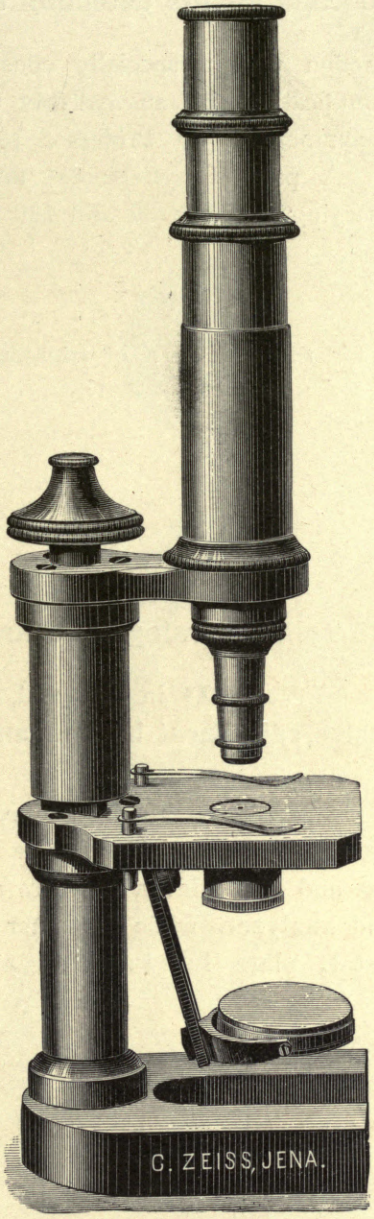


Fig. 31. Stand VII.

($^1/_2$ Full Size.)

The Microscope for the detection of trichinae.

Stand IX[a] in conjunction with a specially constructed triple objective gives three different magnifications by successively unscrewing the component single lenses. It is recommended by Professor JOHNE of Dresden **for the detection of trichinae.** A pair of eye-pieces, thus giving a range of six different magnifications varying between 30 and 190 diameters, is supplied with this stand.

	Price:	Code-word:
No. **92: Microscope for the detection of trichinae** *incl. objective and 2 eye-pieces*	*Marks 80.—.*	**Pastaca.**

Stand IX[b].

(Small Mineralogical Stand.)

This stand is similar to Stand **IX[a]** in size and, like the latter, is not inclinable and possesses **coarse adjustment by rack and pinion only.**

The tube, which is not provided with draw-tube, resembles that of Stand **I[b]** in carrying on its upper extremity a divided circle and a removable analyzer, and a **centring appliance** and **two sliding carriers** at the lower end. One of the latter carries a **second analyzer,** while the other is available for a **quartz, or other kind of crystal, plate for insertion above the objective.** See Fig. 34 on p. 71.

A **BIOT-KLEIN** quartz plate, as also a Selinite film for Red of the I. Order and a Mica film of $^1/_4$ λ, all in suitable settings, are always supplied with Stand **IX[b].** Other Selinite or Mica films in similar mounts are always interchangeable for the crystal plates mentioned.

The polarizer is combined in a sliding sleeve with a condenser system of 1.0 numerical aperture. The upper lens of this condenser is easily removable as, when using low magnifications, it is advisable to work with the lower condenser lens only. A sliding sleeve, within which the **polarizer** may be revolved by means of a lever, is situated below the **revolving and graduated stage.**

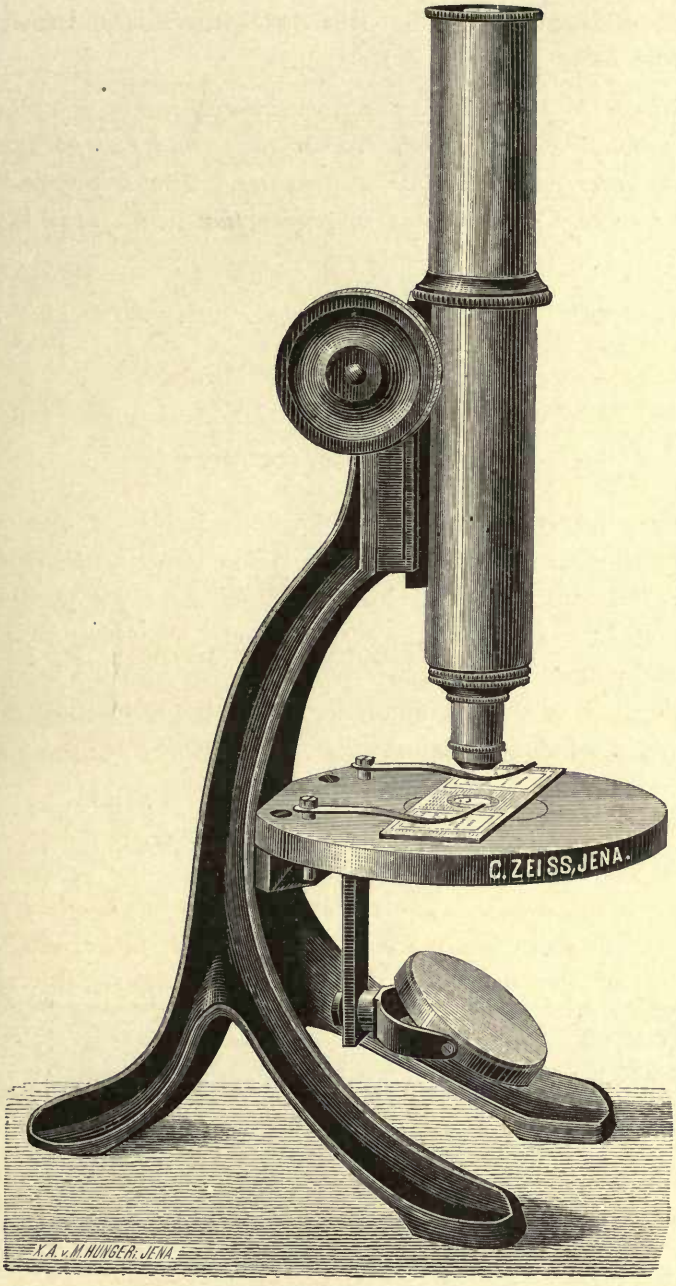


Fig. 32. Stand IX a.

($^1/_2$ Full Size.)

For observing axial images with this stand the ***Axial-image Eye-piece, No. 177,*** *or the analyzer without eye-piece should be used.*

A polarizer, with condenser of 1,0 numerical aperture, and 2 analyzers are always supplied with Stand **IX^b**.

If in addition to the polarizer a cylinder-diaphragm is required, this fact should be duly noted on the order, because the cylinder-diaphragm, No. ***39,*** *is not immediately interchangeable for a polarizer. The iris-cylinder diaphragm, No.* ***40,*** *cannot in any case be used in conjunction with Stand* **IX^b**.

	Price:	Code-word:
No. **93**: *Stand* **IX^b**	*Marks 240.—.*	**Pastelero.**

Hand Microscope.

We supply a **hand microscope** (Fig. 33) suitable for class demonstration. The stage, with clips to hold the specimen, is fixed to the sleeve which receives the body-tube. The instrument is focused by altering the position of the tube in the sleeve and after adjustment securing it by a clamping ring. Fine adjustment is effected by drawing the eye-piece, which fits into the tube with a certain amount of spring, in or out as required. In using the instrument it is directed by hand towards a window or lamp.

	Price:	Code-word:
No. **94**: **Hand Microscope** *without objective or eye-piece, in pine box*	*Marks 15.—.*	**Pastilla.**

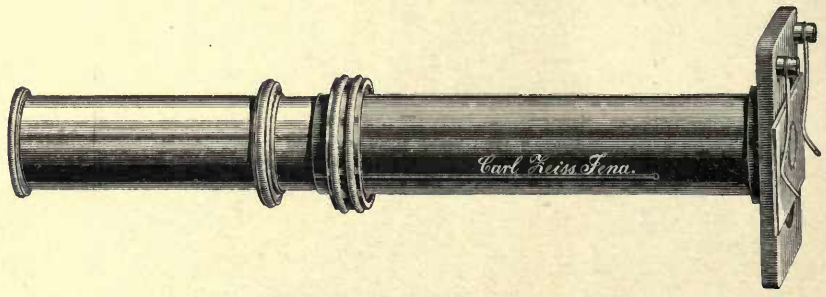


Fig. 33. Hand Microscope.
($^1/_2$ Full Size.)

The prices quoted above include only the stands in mahogany cases, without eye-pieces, objectives and revolving nose-pieces.

Suitable complete specifications are appended at the end of this catalogue.

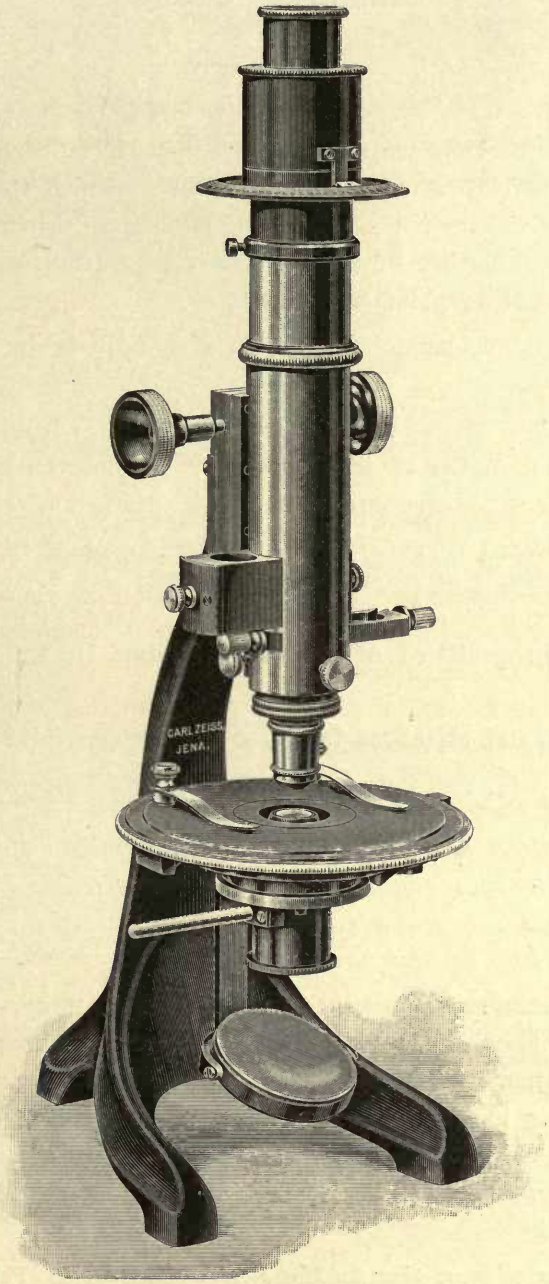


Fig. 34. Stand IX^{b} (small Mineralogical Stand).

($^{1}/_{2}$ Full Size.)

Binocular Stands.

In the course of 1897 we introduced a new form of binocular microscope after designs by Mr. HORATIO S. GREENOUGH in which **stereoscopic vision** is obtained, not by division of a pencil of light passing through a **single object-glass,** but by a **combination of two microscopes, complete in themselves and combined with erecting prisms.**

This type of binocular microscope **is also adjustable by means of rack and pinion.**

The application of erecting eye-pieces fitted with PORRO-prisms affords a convenient means of adjustment for varying intra-pupillary distances. The **pairs of objectives are mounted upon slides** and require adjusting for each stand separately, *consequently it is necessary to send us the tube when subsequently ordering pairs of lenses.* The mount of one of the objectives is provided with screw threads to facilitate **equally sharp focusing of both lenses in cases where inequalities of power of vision in the two eyes require compensating.**

We supply pairs of objectives for these microscopes in five classes (see pp. 18 and 21), **viz:** (55), (a_0), (a_2), (a_3) and (Pl).

Pairs of objectives are immediately interchangeable on any particular stand for which they have been adjusted. The mounts of lenses of the dry series are fitted to their slides in such a manner as to obviate the necessity of readjustment after substituting one set for another.

The most suitable eye-pieces are the HUYGENIAN eye-pieces **1—3;** also a RAMSDEN eye-piece, which is specially constructed for these instruments and is known under the name of **Orthomorphic eye-piece 4,** because of the original design of combining it with small diaphragms in the region of the upper microscopic nodal point in order to satisfy Mr. GREENOUGH's orthomorphic requirements. (For further information see "Zeitschr. f. wissensch. Mikrosk.", vol. XIV, 1897, pp. 294—298.)

Price of Orthomorphic eye-piece **4**: *Marks* 7.—. Code-word: **Palmito.**

The **magnifications** obtainable by combinations of the above objectives and eye-pieces range **between 8 and 72 diameters.** (See tables on p. 21, which also contain data of free working distances and of diameters of the visible areas of objects.)

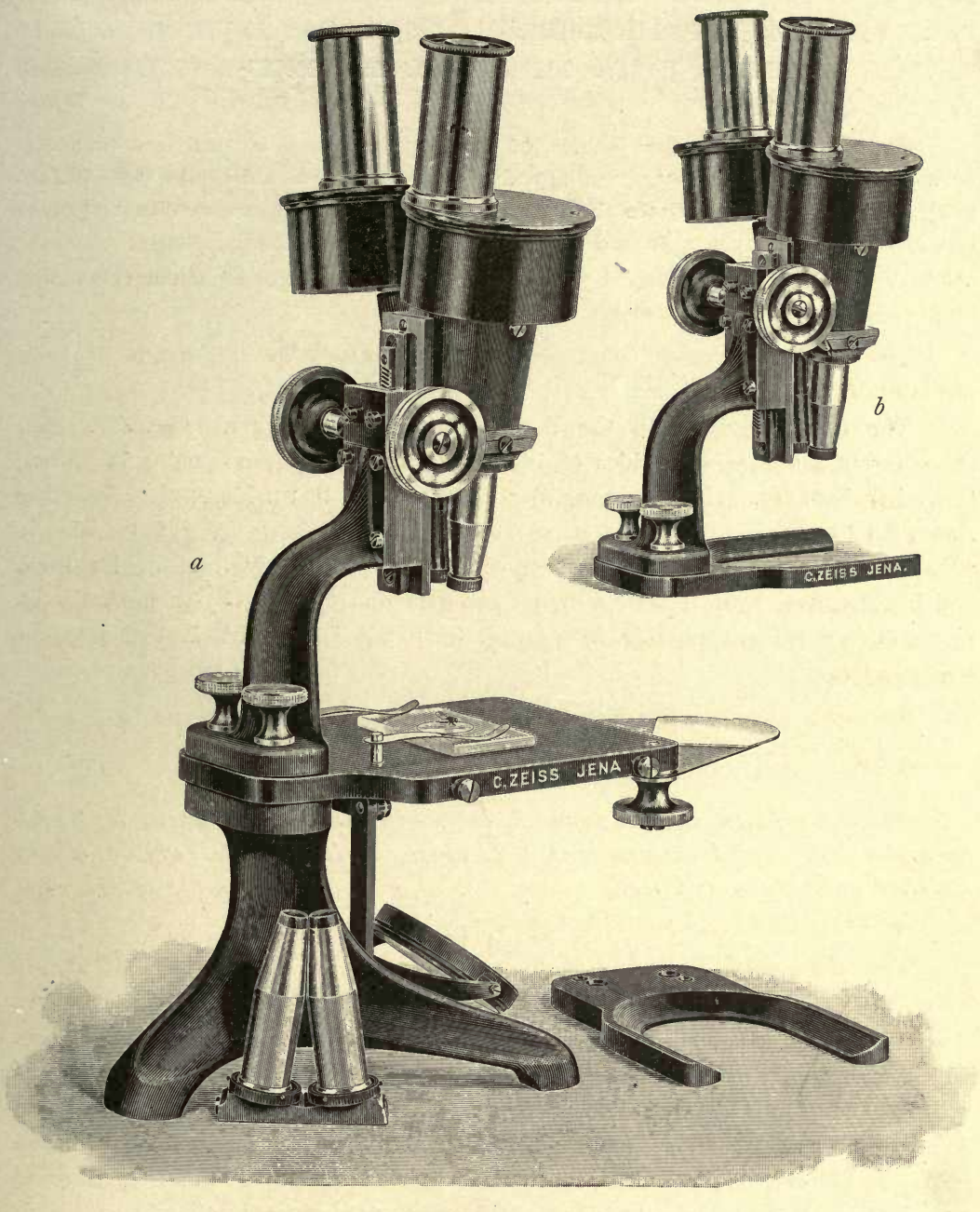


Fig. 35.

a: **Stand X^a (GREENOUGH's Binocular Stand).** ($^1/_2$ Full Size.)

b: **Upper body of Stand X^a (as a "Dermatoscope") with vulcanite fork attached.** ($^2/_5$ Full Size.)

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The surprising relief effect observed in the images, the comparatively large object distance, the facilities for compensating even considerable variations in the individual intra-pupillary distance and inequalities of power of vision, all combine to give our binocular microscopes a very extensive range of application.

The movement of the casings of the PORRO-prisms is sufficient to admit of adjustment for any intra-pupillary distance within normal limits (56—76 mm $= 2^1/_4$—3 in.). In cases where the eyes are abnormally far apart or close together the actual measurements should be specified when ordering.

We supply three different patterns of stands fitted with binocular tubes, viz:

Statif X[a].

GREENOUGH'S Binocular Stand.

The upper body with the double tube is removable. Fig. 35[a]. The stage forms a square with sides of 100 mm (4 in.) and has an opening of 33 mm ($1^5/_{16}$ in.) diameter. Hand-rests similar to those on PAUL MAYER'S Dissecting Stand **P I** (see p. 78) may be attached at both sides of the stage and are always supplied with each stand. After removing the upper body a **vulcanite fork,** which accompanies the stand, may be screwed on to the body-tube carrier in place of the stage. In this form (Fig. 35[b]) the instrument is available for objects of any shape and may, for instance, be conveniently used as a so-called **"Dermatoscope" for examining the skin** &c., the body carrier being steadied by the hand.

No. **95**: *Stand* **X[a]** . . . . . *Price: Marks 195.—. Code-word:* **Pastle.**

With regard to other accessories also made after Mr. HORATIO S. GREENOUGH's designs and known as the "Prism-rotator" and the "Capillary Rotator" see pp. 109 and 110.

Stand X[b].

BRAUS-DRÜNER'S Binocular Dissecting Stand.

This stand (Fig. 36) is primarily designed for the preparation of objects which are too large to be dealt with on the stage of Stand **X[a]**. It is also excellently adapted for **pond-life** studies (whence it may aptly be termed an **Aquarium or Tank Microscope**) and for the observation of portions of large botanical objects, mineralogical specimens, &c., in short, for the microscopical examination of small areas included within more extensive objects which are not to be broken up into smaller fragments.

The prieces quoted above include only the stands and cases, but without objectives and eye-pieces.

Suitable complete specifications are appended at the end of this catalogue.

The optical arrangement is the same as that of Stand **X**^{a}. The stand is provided with an extra sliding piece fitted with the "Society" screw which, when in position, closes the opening of one tube. The other tube may then be employed as a **monocular** microscope, the objective in use having first been exchanged for one of **higher power** if necessary (see „Zeitschr. f. wiss. Mikrosk.", vol. XIV, 1897, pp. 5—10).

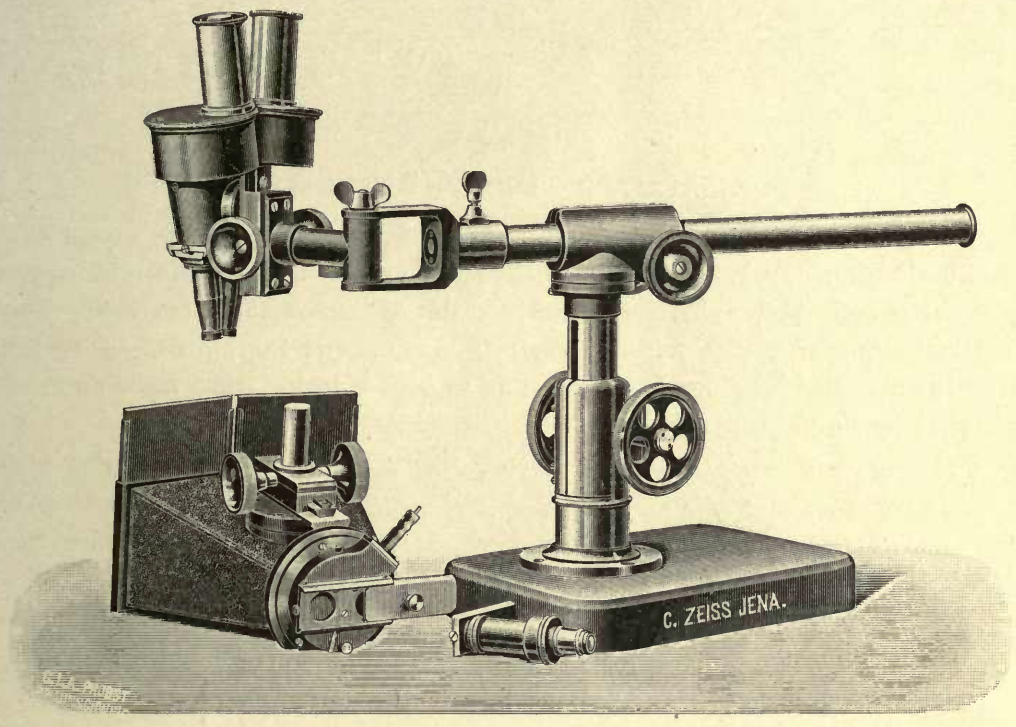


Fig. 36. Stand X^{b} (BRAUS-DRÜNER's Dissecting Stand) with stereoscopic camera and time and instantaneous shutter. ($^{1}/_{4}$ Full Size.)

The stand is mounted on a heavy oblong foot and is fitted with **3 rack-and-pinion and 4 rotary movements.** By the appropriate use of these movements every point of an object, however irregular its outline may be, can be thoroughly examined.

This stand is not provided with a stage. In cases where the microscope is also required for investigations by transmitted light we recommend the use of stage, No. **96a**, *which is very similar to the lower part of Stand* **P I.**

	Price:	Code-words:
No. **96**: *Stand* **X^{b}**	*Marks 260.—*	**Pastoso.**
„ **96^{a}**: *Stage for Stand* **X^{b}**	„ *60.—*	**Pastrana.**

The illuminating appliance, No. **43** *(see pp. 37 and 76) may, if desired, be fitted to Stands* **X^{a}** *and* **X^{b}** *at an additional cost of Marks 36.—.*

At the suggestion of Dr. DRÜNER we have lately commenced to construct Stand **X^{b}** in such a form that a **stereoscopic camera** may be immediately sub-

stituted for the double tube. The illustration shows such a camera, with time and instantaneous shutter, lying at the side of the foot of the stand. For particulars of the construction and of the manner of using this camera refer to DRÜNER's "Ueber Mikrostereoskopie und eine neue vergrössernde Stereoskopcamera" in the "Zeitschr. f. wiss. Mikrosk.", vol. XVII, 1900, pp. 281—293.

	Price:	Code-word:
No. **97**: *Stand* **X^b** *with stereoscopic camera fitted with time and instantaneous shutter . . . . . .*	*Marks 385.—.*	**Pasula.**

Stand X^c.

Dr. S. CZAPSKI's Corneal Microscope.

The double tube is similar to that of the two preceding stands except that an **illuminating apparatus is fitted above the centre line of the microscope** so that the optical axes of both tubes are directed upon the same field. This illuminating apparatus contains a small incandescent lamp and a duplex illuminator, both resting on slides so as to be adjustable, thus facilitating the best possible lighting of the object. Fig. 37.

As a rule we supply a small incandescent lamp, using a pressure of 7 or 8 volts with a current of 1 ampère, and 3 spare lamps. For feeding the lamp it is best to use accumulators. If connection be established with an existing electrical supply system, sufficient resistance must be provided.

The double tube with its illuminator attachment is movable within the vertical plane by means of a joint which works on a horizontal axis and may be clamped in any desired position, while a vertical axis admits of the opposite movement. The microscope is elevated or depressed by means of rack and pinion and a second similar movement effects changes of position from front to rear. The stand rests upon a substantial tripod foot, but it is a good plan to place the whole upon the **sole-plate of a chin-rest.** At the suggestion of Professor EVERSBUSCH this sole-plate is made so as to be movable in two directions at right angles to each other. The movement of the plate — and of the stand with it — from front to rear is effected by hand, that from right to left by means of the milled head *T.*

Fuller details of the construction of this stand are contained in GRAEFE's Arch. f. Ophthalm., vol. XLVIII, 1899, pp. 229—235.

	Price:	Code-words:
No. **98**: *Stand* **X^c** *without sole-plate or chin-rest . .*	*Marks 220.—.*	**Patache.**
„ **99**: „ „ *with* „ „ *and* „ „ . .	„ *265.—.*	**Pataleo.**

The prices quoted above include only the stands and cases, but without objectives and eye-pieces.

Suitable complete specifications are appended at the end of this catalogue.

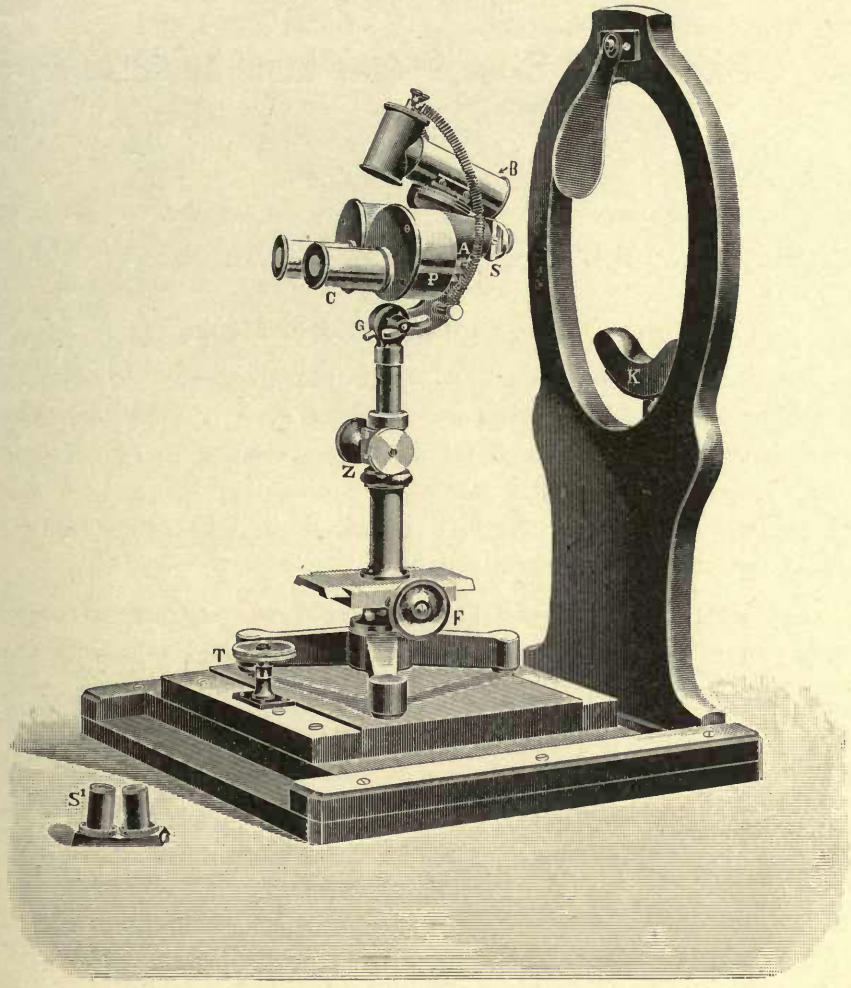


Fig. 37.
Stand X^c (Czapski's Corneal Microscope) with Eversbusch's sole-plate and chin-rest.
(1/5 Full Size.)

Stand **X^c** may also, if desired, be obtained in a somewhat different form, which was suggested by Dr. Braunschweig. Instead of resting on a tripod, the stand is supported on a strong column fixed to the sole-plate, and the shape of the latter and of the chin-rest have also undergone a slight alteration. A round object stage, secured to a pin, may be substituted for the chin-rest, so that the stand may also be used for the examination of microscopic preparations with low powers.

	Price:	Code-word:
No. **100**: *Corneal Microscope, Dr. BRAUNSCHWEIG's pattern*	*Marks 340.—.*	**Patarato.**

Dissecting Stands and Lens-holders.

In order to facilitate the work of dissecting or teasing out small objects it is most desirable to have the free use of both hands, combined with ease and convenience in the use of a lens or a special dissecting combination.

Our dissecting stands and lens-holders are designed to meet these requirements. The demands imposed on stands of this description are many; a sufficiently wide margin in the movement of the holders, suitable illumination for working with both transmitted and reflected light, convenient rests for the hands, facilities for rapid changes of magnification, all these are only a few of the principal points. In many instances it is also desirable to be enabled to make drawings of the objects in various stages of preparation.

Latterly we have made special endeavours so to construct our larger dissecting stands as to meet all the above requirements and to afford the widest possible margin in the admissible dimensions of objects and a very wide choice of magnifications.

A. Dissecting Stands.

Stand P I.

Large Dissecting Stand as suggested by PAUL MAYER.

A short column, which bears the square frame stage (10×10 cm $= 4 \times 4$ in.) and contains inside the rack and pinion adjustment of the objective carrier, rises from a heavy horseshoe foot. A metal or glass plate, either solid or with a central aperture, fits into the stage frame. Convenient folding hand-rests may be attached at the sides of the stage. Fig. 38.

With transmitted light the illumination is provided by plane and concave mirror with universal motions, to which a piece of white paper may be attached so as to produce diffuse illumination. By swinging a black or a white plate round a pivot at the left forward corner of the stage either a dark or light background may be slipped under the object at will.

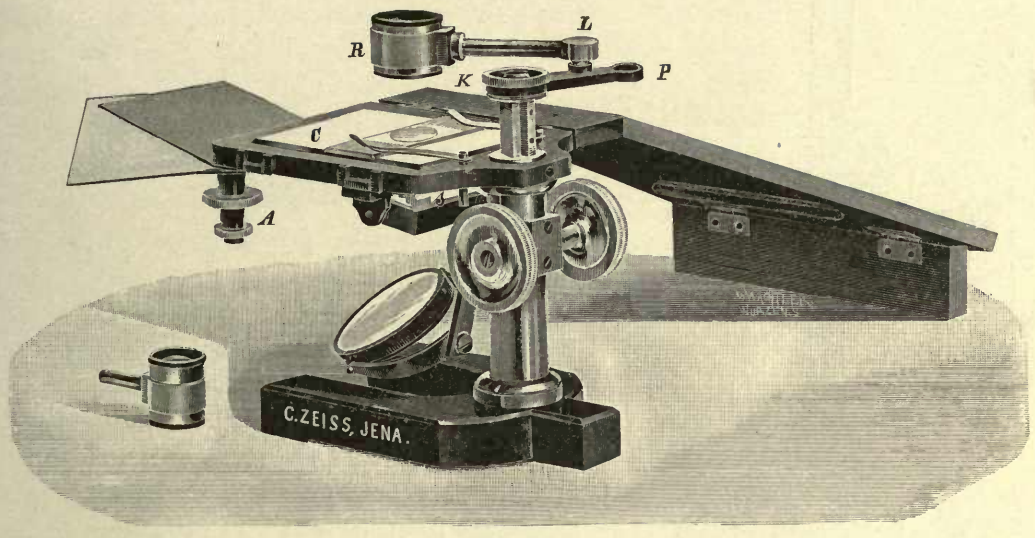


Fig. 38.
Dissecting Stand P I, as suggested by PAUL MAYER.
(1/2 Full Size.)

The distinctive construction of the object-carrier admits not only of the dissecting combination-lens, No. **1**, being fixed at either *P* or *R*, but various other lenses may also be inserted into the holders fitted to the special arm at *L* and *R*. By this arrangement the whole area of the stage can be examined.

The ABBE drawing apparatus, Nos. ***110*** *and* ***111****, may also be used on this stand in combination with lenses* ***9*** *and* ***10****.*

	Price:	Code-word:
No. **101**: *Stand* **P I** *in mahogany case*	*Marks 125.—.*	**Paterno.**

Stand P II.

Large Dissecting Stand and Drawing Apparatus for low magnifications.

This new model not only fulfils all that may be expected of a good dissecting stand, but also affords facilities for drawing large objects on any desired scale within reasonable limits.

Two horizontal arms may be moved by rack and pinion up or down the massive brass column situated on the left. The upper one has a hole bored into its outer extremity for the insertion of various holders for spectacle lenses, magnifiers and for an **erecting microscope;** the lower arm carries a **stage frame** into which a plate of glass, metal or wood may be inserted. See Fig. 39, p. 80.

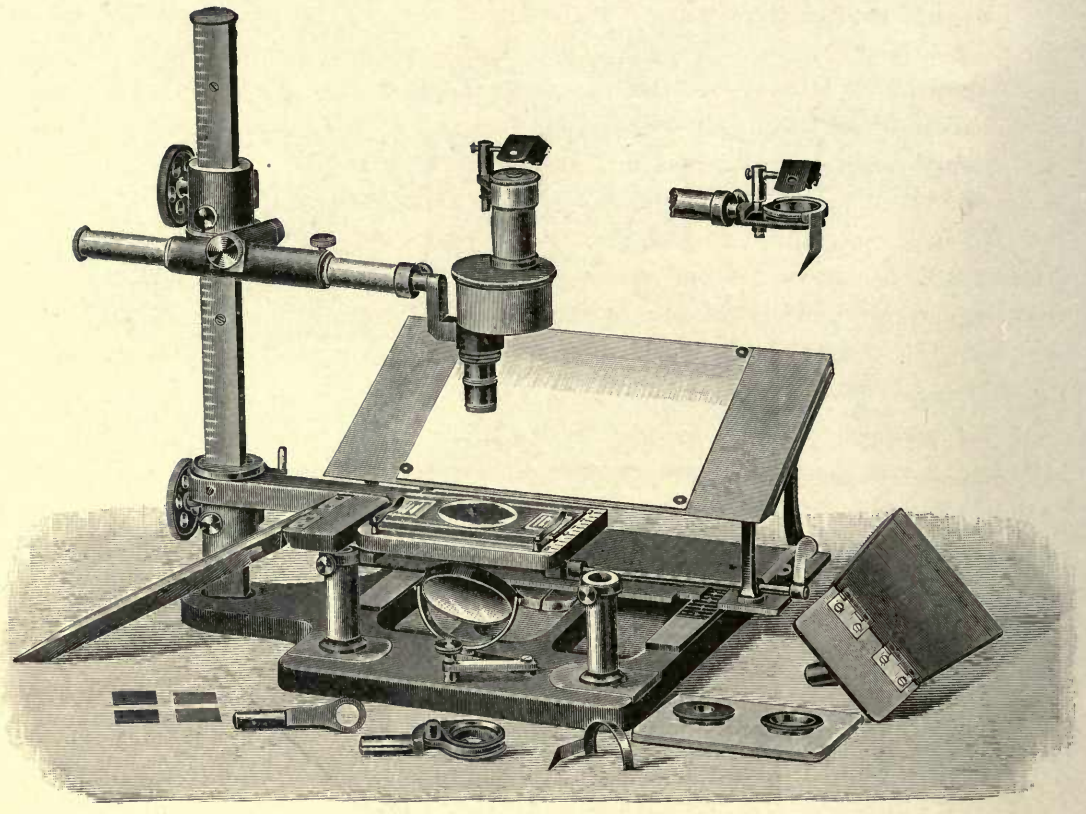


Fig. 39. Stand P II (large Dissecting Stand and Drawing Apparatus for low magnifications). ($^1/_5$ Full Size.)

With transmitted light the illumination is provided by a mirror with universal motions which is inserted into the base-plate or, with very low magnifications, simply by means of a sheet of white paper.

The **drawing prism, No. 109,** slips over the eye-piece, but if it is to be used in conjunction with magnifiers or spectacle-lenses, it is fixed to the sides of their holders.

The **drawing board** rests upon a frame resembling a desk on the face of which it slides up or down at an inclination of 25°. The frame itself slides backward and forward in the groove of the base-plate.

Scales engraved on both sides of the stage in conjunction with a scale on the base-plate serve to ensure **an equal magnification being maintained throughout the process of drawing selected portions of a large object.**

The apparatus can also be used for drawing on a **reduced scale** by placing the object upon the drawing-board and the paper upon the wooden plate of the stage.

Objective a* with variable initial magnification is the most suitable lens for microscopic drawing, although other objectives of low and medium power (to perhaps **C** incl.) may still be used with a fair degree of convenience. The combination of **a*** with HUYGENIAN eye-pieces Nos. 1—5 results in almost any desired magnification, ranging between 2,25 × and 23 ×, being obtained, while the diameter of the visual field varies between about 6 and 45 mm ($^1/_4$ and $1^3/_4$ in.). Spectacle-lenses of from 1 to 5 dioptres yield magnifications from 1,25 to 2,25 diameters. A full description of this apparatus was published by its designer, Mr. MAX BERGER, in the "Zeitschr. f. Instrkde.", vol. XXI, 1901, pp. 171—175, to which we must refer those who wish to obtain fuller details regarding its construction.

The principal advantages possessed by this new apparatus, which we have now been supplying for some considerable time, over other instruments constructed for similar purposes consist in its being available as a drawing apparatus as well as a dissecting stand, that the magnification is variable within a wide margin, and that even the largest objects can be drawn in their entirety on exactly the same scale of magnification. The use of **the erecting microscope** at the same time not only admits of a fairly large distance between object and eye, but also permits the use of higher powers than objective **a*** for the examination of particular portions of the object, without the necessity of removing the latter, or parts of it, from the object-stage.

For dissecting purposes the apparatus is furnished with a pair of hand-rests, which will also be found most useful when drawing on a reduced scale. These rests slip into slits at the two sides of the stage.

		Prices:	Code-words:
No. **102**:	*Dissecting Stand* **P II** *without optical equipment . . .*	*Marks 260.—.*	**Patesea.**
„ **103**:	„ „ „ *with the drum containing PORRO prisms, No.* **192**; *objective* **a***; *HUYGENIAN eye-pieces* **2** *and* **4**; *lenses, Nos.* **9** *and* **10**; **4** *spectacle lenses; drawing prism, No.* **109**	„ *410.—.*	**Paticojo.**

Stand **P II** is supplied in a spacious alder-wood cabinet.

Stand P III.

Medium Dissecting Stand.

As with Stand **P I**, a short column rises from the massive octagonal foot. This column supports the stage (75 × 60 mm = 3 × $2^3/_8$ in.) with central aperture. The rack and pinion movement of the objective-carrier slides inside the column. Two leather-covered hand-rests may be attached to the stage. See Fig. 40 on page 82.

Illumination by transmitted light is effected by a large concave mirror which is movable on two axes at right angles to each other.

It is possible to insert at *A* the arm for the dissecting combination-lens, No. **1**, and the lenses, Nos. **6—8**.

A separate lens-holder L, No. **104a**, *which is also to be inserted at A, is required if lenses, Nos.* **9** *and* **10**, *are to be used.*

		Prices:	Code-words:
No. **104**:	*Dissecting Stand* **P III** *in cabinet, without lenses*	*Marks 70.—.*	**Patin.**
„ **104a**:	*Holder for the lenses, Nos.* **9** *and* **10** . . .	„ *4.—.*	**Patinejo.**

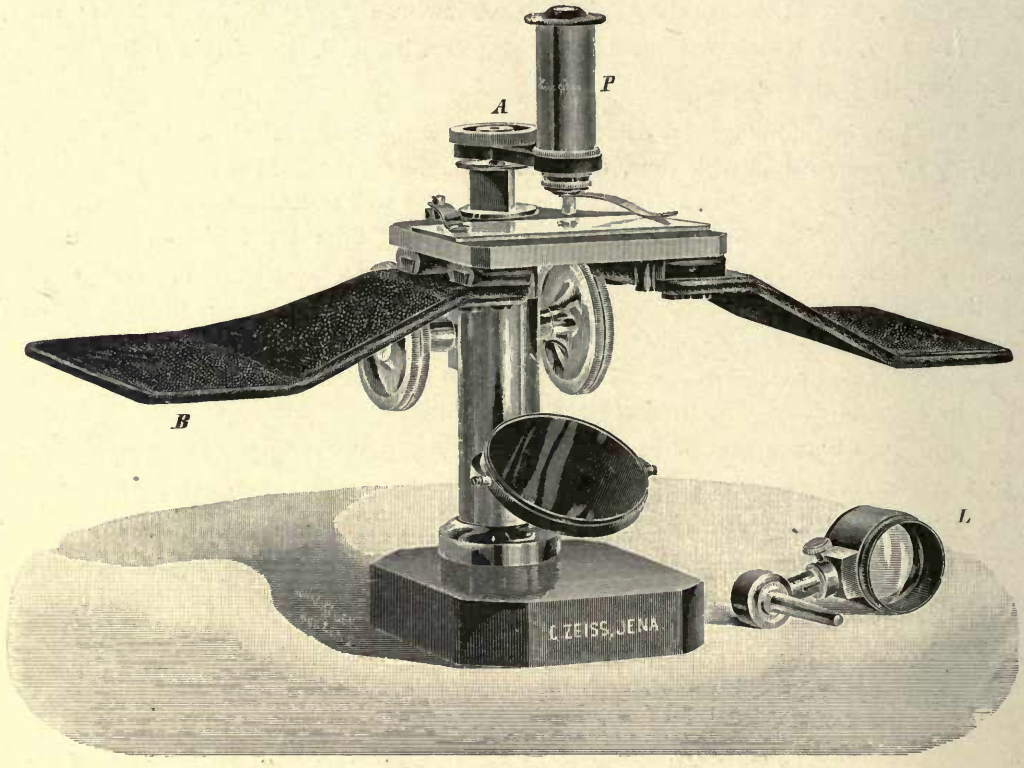


Fig. 40. Stand P III (medium Dissecting Stand).
($^1/_2$ Full Size.)

Stand P V.
Small Dissecting Stand.

The sides of the stage, above which a lens slides up and down in a holder, measure about 50 mm (2 in.). The holder is adapted for lenses, Nos. **6—8** and **13—16**. Fig. 41.

This stand is supplied either separately or with blocks for supporting the hands.

		Prices:	Code-words:
No. **105**:	*Dissecting Stand* **P V**, *without lenses, with blocks* .	*Marks 14.—.*	**Patira.**
„ **106**:	„ „ „ „ „ *without blocks*	„ *12.—.*	**Patochada.**

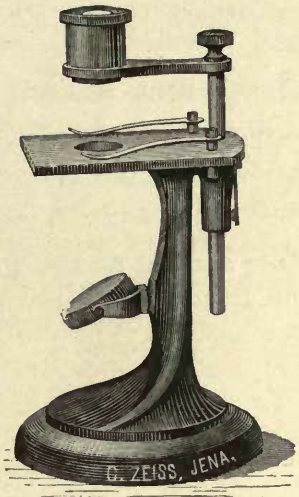


Fig. 41. Stand P V (small Dissecting Stand). ($^1/_2$ Full Size.)

B. Lens-Holders.

Stand L I.
Large Lens-Holder.

This lens-holder stands upon a heavy metal foot and has two hinged joints *b* and *c*. It rotates on a vertical axis and is adjustable in elevation by means of the rack and pinion movement *d*. The movement on the vertical axis is arrested by the screw *a* and after adjustment **both joints can be fixed simultaneously by turning the thumb-screw *b*.** Fig. 42. (See "Zeitschr. f. Instrkde.", vol. XV, 1895, pp. 322—323; also "Zeitschr. f. wiss. Mikrosk.", vol. XII, 1895, p. 318.)

No. **107**: *Lens-holder* **L I**, *without lenses* *Price: Marks 40.—.* Code-word: **Patologico.**

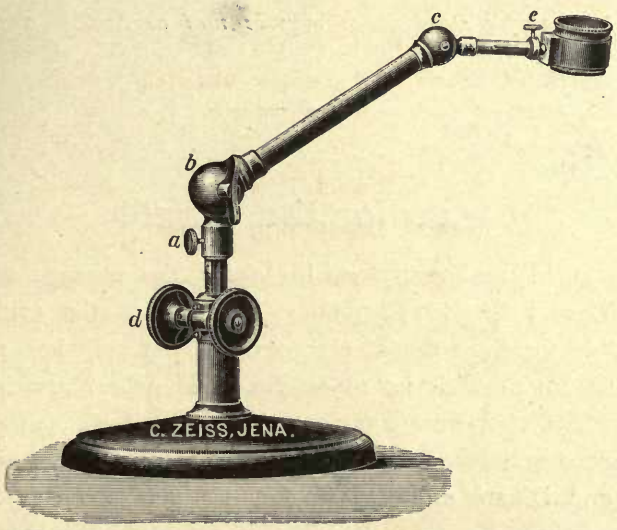


Fig. 42. Stand L I (large Lens-holder). ($^1/_3$ Full Size.)

Stand L II.

Small Lens-Holder.

This holder consists of a heavy metal foot with vertical brass rod and a jointless lens-holder which slides up and down the rod on a sprung collar. Fig. 43.

No. **108**: *Lens-holder* **L II** *Price, without lenses: Marks 15.—.* Code-word: **Patriareal.**

This lens-holder is specially adapted for the BRÜCKE lenses, Nos. 3 and 4, but can also be employed with lenses, Nos. 9 and 10.

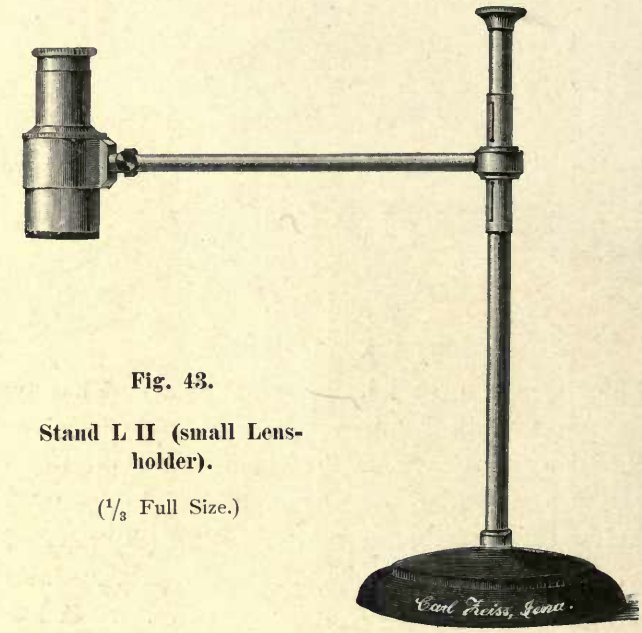


Fig. 43.

Stand L II (small Lens-holder).

($^1/_3$ Full Size.)

With regard to a simple stand which may be used as lens-holder in conjunction with our drawing apparatus, see p. 91.

Cases for the Stands.

We supply **solid mahogany cabinets** for the storage and transport of Stands **I, II, IV, VI** and **X^a** (see Fig. 44). The size of the cabinets is reduced as much as possible for the sake of compactness, yet sufficient room is provided for the entire instrument with its objectives (even when attached to revolving nose-pieces or sliding changers) and eye-piece, and for a sufficient number of objectives, eye-pieces and some few accessory appliances.

Stands **VII** and **IX** are supplied in **flat mahogany cases** into which they are placed horizontally.

We also supply suitable cases of mahogany or other kinds of wood for all the other stands (except Dissecting Stand **P V** and the Lens-holders).

The price of the cabinet or case is always included in that of the stand.

In the event of a considerable number being ordered at one time we are prepared to supply Stands VI, VII and IX without the mahogany cabinets at a corresponding reduction in price (amounting to 15—30 Mk. according to kind of packing), the instruments being all packed together in one plain packing case.

Leather travelling-cases for the protection of the mahogany cabinets are supplied in various sizes. See Fig. 45.

Prices of Leather travelling-cases according to size from Marks 18.— to Marks 30.—.

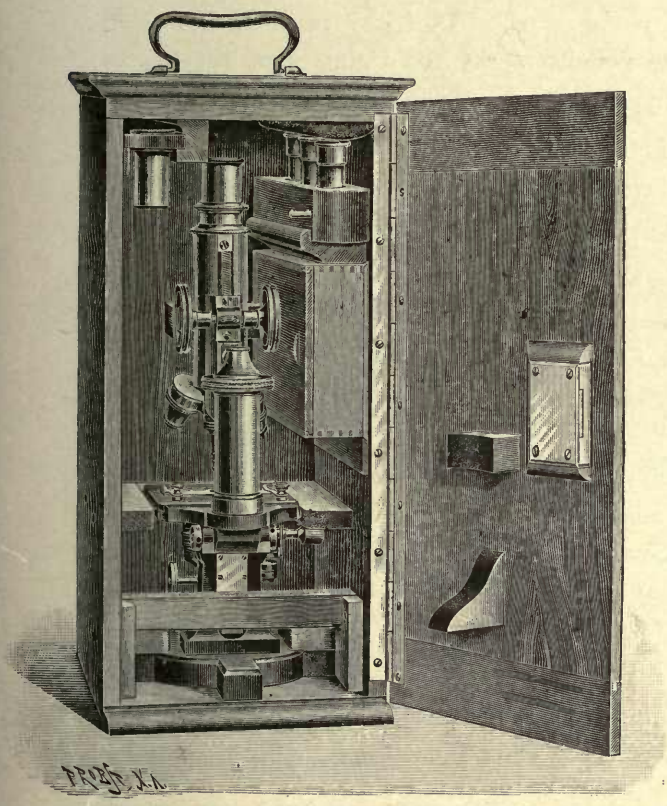


Fig. 44. Stand IV^{a} standing in its cabinet.

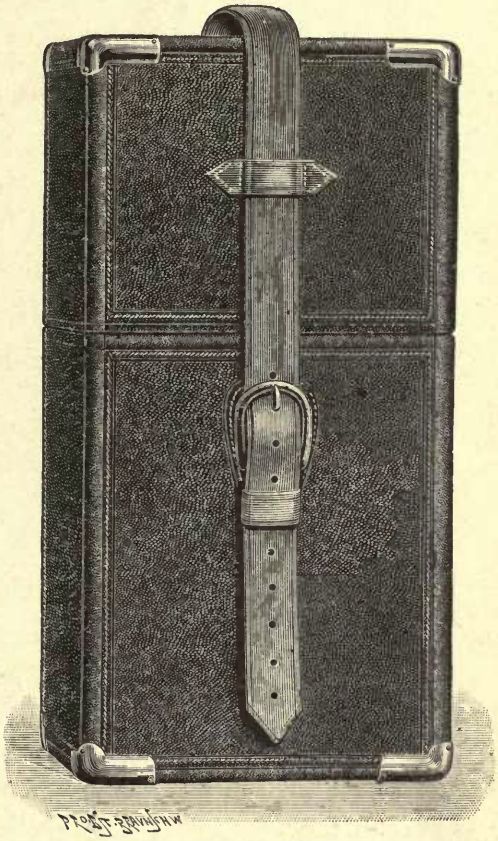


Fig. 45. Leather travelling-case for microsc. cabinet.

If desired, the **owner's name may be engraved** upon the base of the stand.

Charge for engraving name on Stand: Marks 3.—. Code-word: **Patriota.**

Nickelled name plates for the mahogany cabinets are also supplied.

Price of nickelled plate, including engraving of name: Marks 5.—. Code-word: **Patricio.**

Accessory Apparatus.

A. Drawing Apparatus.

The drawing surface in all drawing apparatus of our make is rendered visible by double reflection, while the pencils of rays emerging from the microscopes or magnifiers reach the eye by a direct path.

In addition to the old form of **"Camera lucida"** — the **drawing prism,** No. **109**, shown in Fig. 46 and introduced by us in 1869 — the **drawing camera designed by Professor ABBE** has been supplied by us for about the last 20 years.

While in the drawing prism, as also most other existing forms of drawing apparatus, only a semi-circular portion of the emerging pencil can be utilized, in the ABBE drawing camera the full area of the pencil is effective. Loss of light is therefore avoided even when using the highest magnification, while both the pencil and the drawing surface remain quite clearly visible.

This material advantage is gained by the application of a small cube, composed of two equal rectangular prisms cemented together — the so-called **"ABBE cube"** — in the position of the eye-point of the ocular. The cemented surface of the upper prism is silvered but has a central aperture of 1 or 2 mm diameter.

By a simple arrangement facilities are given for centring the opening in the silvered surface in relation to the emerging pupil of the microscope in such a manner that the pencil of rays, issuing after double reflection from the drawing surface and thence through the eye-piece, reaches the eye of the observer concentrically.

The **brightness of the drawing surface and of the image can be modified** in all our drawing apparatus by the **interposition of smoked glasses.** With drawing prism, No. **109**, as also with the small ABBE drawing camera, No. **110**, one or two smoked glasses may be inserted into the prism casing. The brightness of the image may be moderated in either of two ways, i. e., by appropriate stopping or by the use of smoked glasses in connection with the illuminating source.

For the purpose indicated above the large ABBE drawing cameras, Nos. **111** and **112**, are fitted with a cap encasing the prisms from above, which is provided with moderating glasses of varying degrees of density, and with a similarly equipped excentric disk pivoted below the prisms. In both appliances only five of the six openings contain smoked glass, the sixth remaining clear so that the cap and disk may remain attached although the brightness of the image or of the drawing surface may not require moderating.

In order to enable the increased cone of emerging rays obtained with low magnifications being fully utilized, the usual ABBE cube with aperture of 1 mm can, with the large drawing apparatus, quickly and conveniently be exchanged for another of 2 mm aperture (see Fig. 48[b]).

Glasses to correct defects of vision are, if required, supplied with our drawing apparatus.

***Old form of Camera lucida,** No. **109.** This **drawing prism** is only supplied in the form shown in Fig. 46. The prism casing turns round a horizontal axis and is also adjustable in elevation. It fastens to the tube by means of a sprung collar and can easily be turned aside.

	Price:	Code-word:
No. **109**: *Drawing prism (Camera lucida), incl. case*	*Marks 21.—.*	**Patron.**

In conjunction with Dissecting Stand **P II**, *which, when used as a drawing apparatus with low magnifications, may be extremely useful in many ways, we supply this simple drawing prism exclusively (see pp. 79—81).*

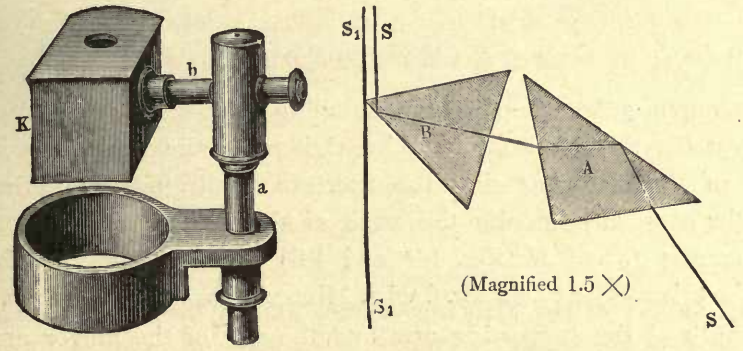


Fig. 46. Drawing prism (Camera lucida), No. 109. (3/4 Full Size.)

The ABBE **drawing cameras** are constructed in three different forms:

1. ***Small ABBE Drawing Camera,** No. **110.** The prism casing and the mirror — the latter supported by an extended arm about 105 mm (4 in.) long —

are connected with the clamping ring by hinges. The size of the mirror is 50 × 75 mm (2 × 3 in.). The clamping ring is attached to the draw-tube before putting on the ocular and is secured by means of three screws. The upper parts — prism casing and mirror — can be turned back on their hinges so as to enable the object being viewed direct instead of through the prism. The ABBE cube and other parts always return to exactly the same position on being restored to their original place. (See Fig. 47.)

	Price:	Code-word:
No. **110**: *Small ABBE Drawing Camera, incl. case . .*	*Marks 30.—.*	**Patronato.**

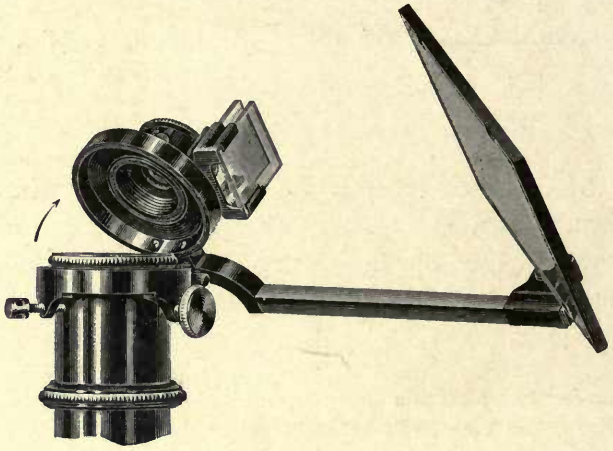


Fig. 47.
Small ABBE Drawing Camera, No. 110.
(3/5 Full Size.)

2. *Large ABBE Drawing Camera, No. 111.

After removing the eye-piece the clamping ring of the drawing apparatus is slipped over the tube and fastened by tightening the screw *S*. By altering the position of the clamping ring the aperture in the silvered prism may be brought to the same height with the pupil of the emerging rays of the microscope. The screws *L* and *H* (Fig. 48[a] and 48[b]) serve to facilitate the accurate centring of the prism. (See "Zeitschr. f. wiss. Mikrosk.", vol. XI, 1894, pp. 289—298.)

The length of the supporting arm and the size of the mirror are the same as with the preceding apparatus.

The casing, together with the prism and the moderating glasses, may be turned aside about the pin *Z* into the position indicated by the dotted lines in Fig. 48[a].

	Price:	Code-word:
No. **111**: *Large ABBE Drawing Camera, incl. case . .*	*Marks 60.—.*	**Patudo.**

3. ***Large Abbe Drawing Camera,** No. **112.** This form of the apparatus is **adapted for the eye-pieces with enlarged field of view.** The length of the arm supporting the mirror is 125 mm (5 in.), the size of the mirror 80 × 125 mm ($3^1/_8 \times 5$ in.).

No. **112**: *Large ABBE Drawing Camera, for the eye-pieces with enlarged field of view, incl. case: . . . .* Price: *Marks 72.—.* Code-word: **Paulatino.**

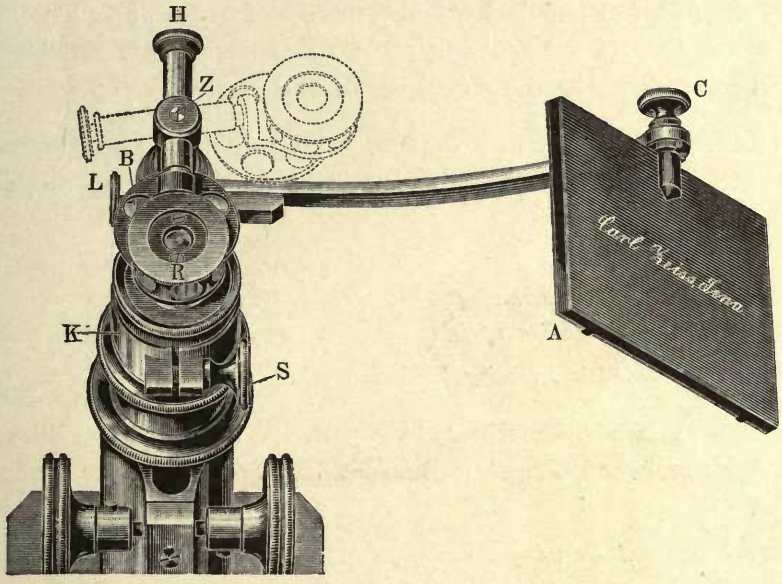


Fig. 48a. ABBE Drawing Camera, No. 111. ($^3/_5$ Full Size.)

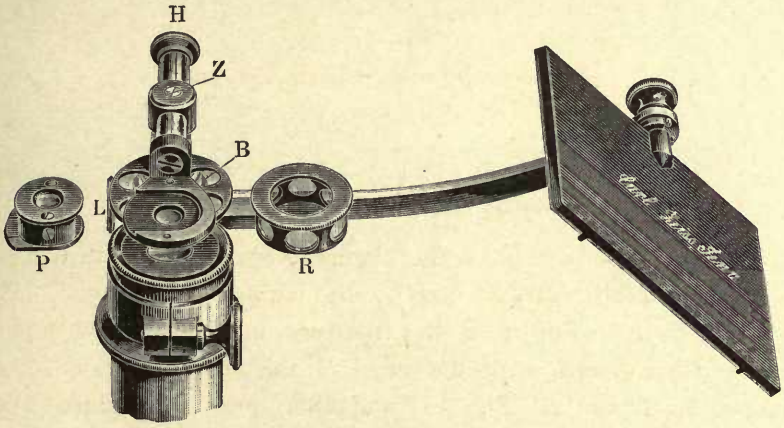


Fig. 48b. ABBE Drawing Camera, No. 111. ($^3/_5$ Full Size.)
Showing ABBE's prism (*P*) and the cap with moderating glasses (*R*) removed.

Drawing Tables and Boards.

In order to obtain copies of objects free from distortion and with a field of view of fair size, it is advisable to use a support for the drawing paper, inclined at the proper angle. We supply various patterns of drawing tables and boards suitable for this purpose.

The two forms of ***Bernhard's drawing tables** satisfy in a perfect manner the twofold requirement of being adapted for regulating the height of the drawing surface above the work table and for varying its degree of inclination to the horizontal plane. (See "Zeitschr. f. wiss. Mikrosk.", vol. IX, 1892, pp. 439—445 and vol. XI, 1894, pp. 298—301.)

With tables of above pattern the drawing surface may be raised to a height of 17 cm ($6^3/_4$ in.) and inclined at an angle of about 35°. The microscope is clamped to the base of the drawing table, and arm-rests are provided in order to give the operator's hands the steadiest possible position.

The table is supplied either for use with the microscope in the upright position or with an **arrangement for inclining** the microscope together with the table. (Fig. 49.)

		Prices:	Code-words:
No. **113**:	*BERNHARD's Drawing Table for use with microscopes standing upright . . . . . .*	*Marks 45.—.*	**Pausado.**
„ **114**:	*BERNHARD's Drawing Table inclinable . .*	„ *52.—.*	**Pautador.**

In addition to above-described two patterns of drawing tables we also supply suitable **lime-wood Drawing Boards,** having the surface inclined at an angle of 25°.

No. **115**: *Lime-wood Drawing Board . .* *Price: Marks 2.50.* Code-word: **Pavana.**

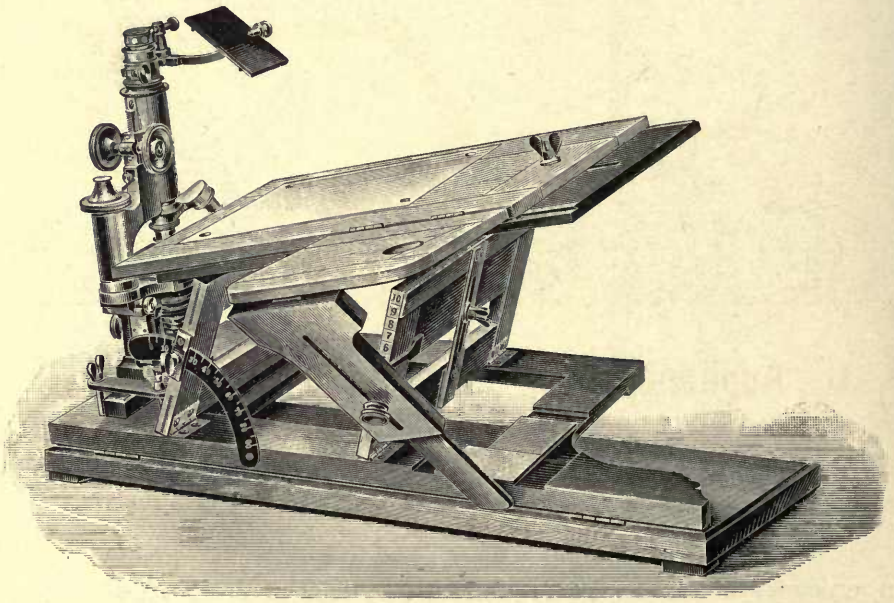


Fig. 49.

Bernhard's Drawing Table, No. 114, with microscope and drawing camera attached.
($^1/_6$ Full Size.)

A very simply constructed stand — GILTSCH's **Drawing Stand,** No. **116** — is specially designed for use with drawing prism, No. **109**, and with the large ABBE drawing camera, No. **111.** This apparatus is adapted for lenses, Nos. **9** and **10**, as well as for various powers of spectacle-lenses. The details of construction are plainly apparent from Fig. 50.

No. **116**: *GILTSCH's Drawing Stand: Marks 35.—.* Code-word: **Pavia.**

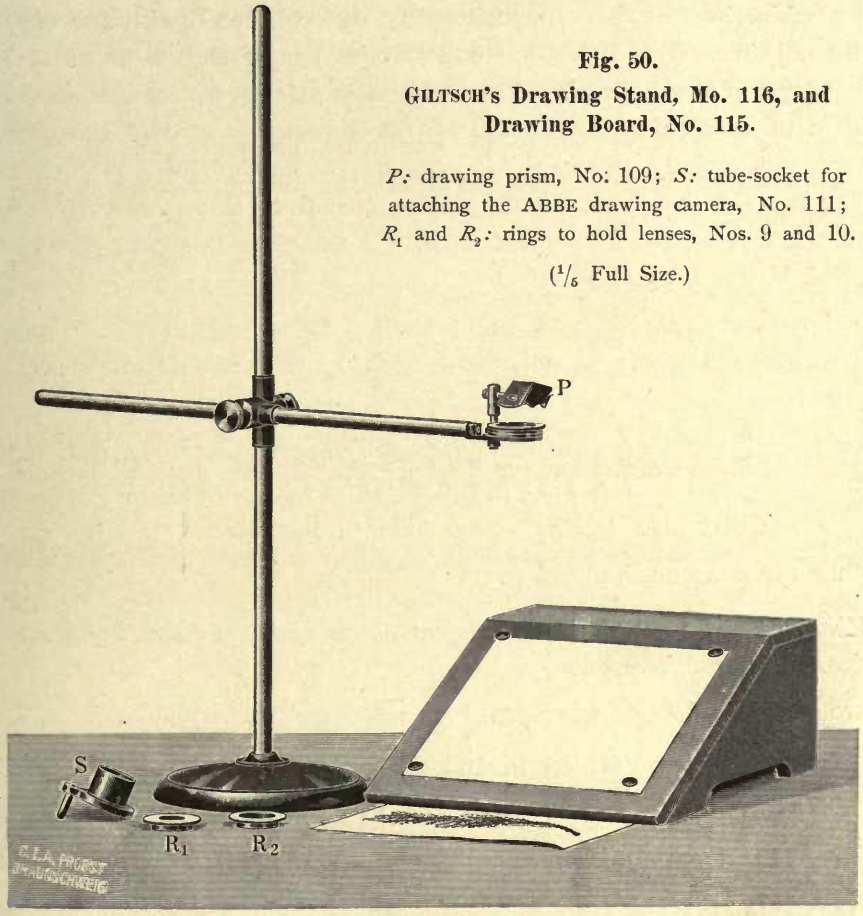


Fig. 50.
GILTSCH's Drawing Stand, Mo. 116, and Drawing Board, No. 115.

P: drawing prism, No. 109; *S:* tube-socket for attaching the ABBE drawing camera, No. 111; R_1 and R_2: rings to hold lenses, Nos. 9 and 10.

($^1/_5$ Full Size.)

B. Appliances for measuring and counting microscopic objects.

Measuring Apparatus.

Micrometer Eye-pieces and Stage Micrometers.

The requirements of measuring microscopic objects are in most cases met by the use of simple **eye-piece micrometers,** i. e., of small glass disks with divisions, which are dropped into the eye-pieces with the side bearing the

division lines downwards. The values of divisions are best determined by comparison with a good stage-micrometer for each combination of objective and eye-piece. Approximate values, which are in many cases sufficiently accurate, will be found in tables supplied with each eye-piece micrometer. These tables apply to combinations of achromatic objectives with HUYGENIAN eye-pieces, and are calculated for the prescribed (160 mm) tube-length.

In combinations of the compensating eye-pieces **6** with any of the apochromatic objectives the approximate determination of the value of an interval becomes very much simplified. The divisions in this eye-piece are so computed that with a tube-length of 160 mm the value of one interval of the micrometer scale represents exactly as many micra, μ (0.001 mm = 0.00003937 in.), as there are millimetres in the focal length of the objective, i. e., Apochromatic lens: **16 mm**, **8 mm** &c., value of interval: 16 μ, 8 μ &c. (See "Zeitschr. f. wissen. Mikrosk.", vol. V, 1888, pp. 150—155.)

As however these values also are still only approximate, a comparison must be made with the stage-micrometer whenever more exact measurements are required.

Our regular manufacture of **Eye-piece Micrometers** is restricted to the one form, catalogued as No. **117: 5 mm divided in $^1/_{10}$ mm.**

Price, incl. case: Marks 5.—. Code-word: **Pavilon.**

Other divisions on application.

When ordering eye-piece micrometers please state whether they are required for ordinary or for micrometer eye-pieces.

Two forms of **Stage Micrometers** are regularly supplied:

No. **118: 1 mm divided in 100 parts.**

Price, incl. case: Marks 10.—. Code-word: **Pavimiento.**

No. **119: 1 cm divided in millimetres, the last in tenths.**

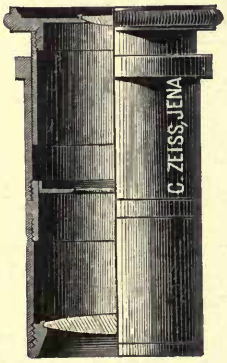


Fig. 51. Micrometer Eye-piece. (Full Size.)

Price, incl. case: Marks 6.—. Code-word: **Pavon.**

With regard to eye-piece and stage cross-line micrometers refer to pp. 96—98.

Eye-pieces with sliding eye-lenses, so-called **"micrometer eye-pieces"**, are constructed for the purpose of facilitating exact adjustment of the micrometer scale to the eyes of individual observers. These are the HUYGENIAN eye-pieces **2** and **3** for achromatic and compensating eye-piece **6** for apochromatic objectives. Fig. 51.

By fitting a drum-shaped adapter to these micrometer eye-pieces lateral adjustment of the micrometer scale, or of an index (see under Index Eye-pieces, p. 108), becomes also possible. When thus fitted, they are called **"Drum Eye-pieces with Micrometer"** and may also consist of either the HUYGENIAN eye-pieces **2** or **3** or compensating eye-piece **6**.

Prices of Micrometer Eye-pieces for achromatic objectives with HUYGENIAN eye-piece **2** *or* **3** *as desired:*

		Price:	Code-words:
No. **120**:	*with drop-in micrometer scale*	*Marks 18.—.*	**Pavonazo.**
„ **121**:	*micrometer laterally adjustable by means of a screw (Drum Eye-piece with Micrometer)*	„ *40.—.*	**Pavorde.**

Prices of Micrometer Eye-pieces for apochromatic objectives with compensating eye-pieces **6**:

No. **122**:	*with drop-in micrometer scale*	„ *31.—.*	**Pavura.**
„ **123**:	*micrometer laterally adjustable by means of a screw (Drum Eye-piece with Micrometer)*	„ *53.—.*	**Payaso.**

The prices of micrometer eye-pieces, Nos. **121** *and* **123** *include cases.*

For prices of PLAGGE's Projection Micrometer Eye-pieces refer to list of prices at end of catalogue, p. 131.

For very exact measurements a ***Screw Micrometer Eye-piece** is required. This form of instrument as constructed by us is shown in Fig. 52. It consists of a RAMSDEN eye-piece of about 20 mm ($^3/_4$ in.) focal length —

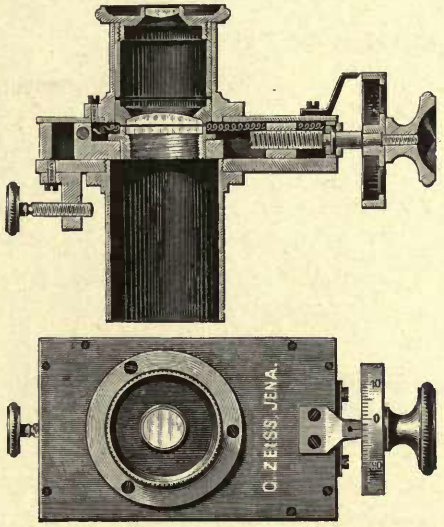


Fig. 52. Screw Micrometer Eye-piece, No. 124.
Sectional elevation and plan view. ($^2/_3$ Full Size.)

corresponding magnification = 12 diameters — or a suitable compensating eye-piece and a very carefully constructed micrometer with divided drum. The glass plate, with a crossed as well as a double line, is moved across the field by means of the micrometer screw. Each interval of the divided drum corresponds to a movement of 0.01 mm of the point marked. Complete revolutions of the drum are counted by means of a numbered scale seen in the field. The measurement can be extended over a tract of 4 mm of the objective image.

The absolute values corresponding to the divisions of the drum should be determined by the aid of a stage-micrometer for each separate objective.

		Price:	Code-words:
No. **124**:	*Screw Micrometer Eye-piece for achromatic objectives, in case*	*Marks 90.—.*	**Peal.**
„ **125**:	*Screw Micrometer Eye-piece with compensating eye-piece* **6**, *in case*	„ *105.—.*	**Pebetero.**

For the exact measurement of objects too large for inclusion in one visual field of the microscope we construct the ***Stage Screw Micrometer,** No. **126** (see Fig. 53). A slider moved by the micrometer screw carries a rotating disk with divided circle. The divisions of the drum indicate 0.002 mm; complete

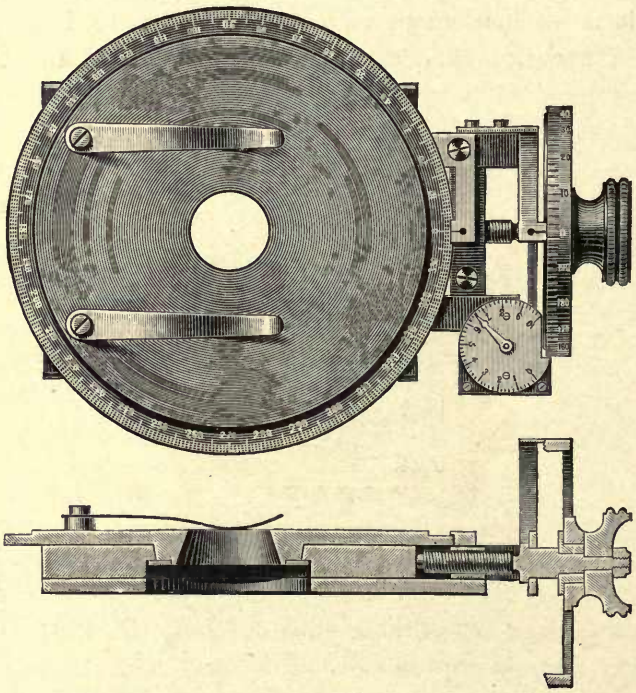


Fig. 53. Stage Screw Micrometer, No. 126.
(2/3 Full Size.)

revolutions of the drum are counted by an index. The screw measures up to 10 mm.

No. **126**: *Stage screw Micrometer, in case, Price: Marks 120.—.* Code-word: **Pecable.**

The instrument is adapted for all our large and medium stands with the exception of that for brain sections. In subsequent orders the factory number of the stand should be quoted.

For **measuring the angles** of microscopic objects we construct the **Goniometer Eye-pieces,** Nos. **127** and **128,** the former number with HUYGENIAN eye-pieces **2** or **3**, the latter with compensating eye-piece **4.** The eye-lens is adjustable as with the micrometer eye-pieces. A glass disk with a series of parallel lines ruled upon it rests upon the diaphragm. An indicator, attached to the upper part of the eye-piece, moves within a divided circle fixed on the draw-tube.

		Price:	Code-words:
No. **127**:	*Goniometer Eye-piece with HUYGENIAN eye-pieces* **2** *or* **3** *with divided circle, in case . . . . .*	*Marks 35.—.*	**Pecante.**
„ **128**:	*Goniometer Eye-piece with compensating eye-piece* **4** *with divided circle, in case . . . . . .*	„ *48.—.*	**Pecemento.**

Appliances for measuring thicknesses.

Dial Cover-glass Gauge, No. **129,** for the exact measurement of the thickness of cover-glasses, thin plates, &c. — The measurement is effected by means of a clip projecting from a box-shaped round casing (see Fig. 54). The reading is given by an indicator moving over a divided circle on the lid of the box. The divisions show hundredths of a millimetre. The gauge measures thicknesses up to 5 mm.

Price: Marks 30.—. Code-word: **Pecora.**

Fig. 54. Cover-glass Gauge, No. 129.
(2/3 Full Size.)

Cover-glass Gauge of simpler construction, No. **130.** This instrument consists mainly of a screw with divided drum and, like the preceding, records readings of 0.01 mm.

Price: Marks 15.—. Code-word: **Pectoral.**

Measuring Scales and fully divided Circles.

We are prepared to supply **measuring scales on nickel-silver or plate-glass** in any form desired. The following are a few patterns regularly stocked by us:

Nickel-silver Rule:

No. **131: 10 cm divided in millimetres.**
Price: Marks 3.50. Code-word: **Pecunia.**

Rules on plate-glass:

„ **132: 5 cm divided in $^1/_2$ millimetres.**
Price: Marks 2.50. Code-word: **Pedaceria.**

„ **133: 10 cm divided in millimetres.**
Price: Marks 3.50. Code-word: **Pedagogo.**

„ **134: 20 cm divided in millimetres.**
Price: Marks 7.—. Code-word: **Pedano.**

„ **135: 30 cm divided in millimetres.**
Price: Marks 12.—. Code-word: **Pedestal.**

Rules on plate-glass with double scale, one side in millimetres, the other in English inches.

No. **136: 5 cm divided in $^1/_2$ millimetres** (2 inches in 48 parts).
Price: Marks 3.50. Code-word: **Pedido.**

„ **137: 10 cm divided in millimetres** (4 inches divided in 48 parts).
Price: Marks 4.50. Code-word: **Pediluvio.**

Fully divided Circles on plate-glass are kept in stock in the two following sizes:

No. **138: Circles of 80 mm ($3\,^1/_8$ in.) diameter divided in $^1/_1$ degrees.**
Price: Marks 10.—. Code-word: **Pedometro.**

„ **139: Circles of 120 mm ($4\,^3/_4$ in.) diameter, divided in $^1/_2$ degrees.**
Price: Marks 15.—. Code-word: **Pedrada.**

The nickel-silver rules have bevelled edges. In rules on plate-glass and in the fully divided circles the figures are in mirror-type so that the divisions may be laid on the surface of objects to be measured and be easily read off without parallax.

Appliances for Counting.

Cross-line Micrometers are usually employed for counting small objects, such as blood-corpuscles, yeast-cells, bacteria, &c.

We supply an **Eye-piece cross-line Micrometer** to rest on the diaphragm of the eye-piece or, preferably, for use with a micrometer eye-piece having an

adjustable eye-lens. The division embraces a square of 5 mm, divided into squares of 1.0 or 0.5 mm, as may be desired.

	Price:	Code-word:
No. **140**: *Eye-piece cross-line micrometer, in capsule . .*	*Marks 5.—.*	**Pedregoso.**

When ordering please state whether the micrometer scale is required for an ordinary or for a micrometer eye-piece.

The **Eye-piece Stops proposed by P. EHRLICH,** No. **141**, may be used for counting the number of corpuscles within a field of known area, in a similar manner as the eye-piece cross-line micrometers. These stops are provided with square openings and are supplied in assorted sets having squares of 1, 2, 3, 4, 6, 8 and 10 mm.

	Price:	Code-word:
No. **141**: *Set of EHRLICH's stops (7 pieces) . . . .*	*Marks 10.—.*	**Pedril.**

In the case of eye-piece cross-line micrometers as well as EHRLICH's stops — unless the latter are merely intended for verification of the quantities within the same area — it is necessary for each combination of objective and eye-piece to ascertain, by means of stage micrometers, the actual surface values corresponding to the various fields.

EHRLICH's stops being primarily designed for use in conjunction with micrometer eye-pieces (see p. 92), it should be expressly stated when ordering them if they are to be used with other types of eye-pieces.

Cross-line Stage Micrometers are, as a rule, supplied only in connection with the appliance known as the ***Counting Chamber** (see Fig 55, a and b). This latter consists of a cell of exact and uniform depth of 0.1 mm, the bottom of which is ruled in squares (see Fig. 55, c). The most commonly used form of

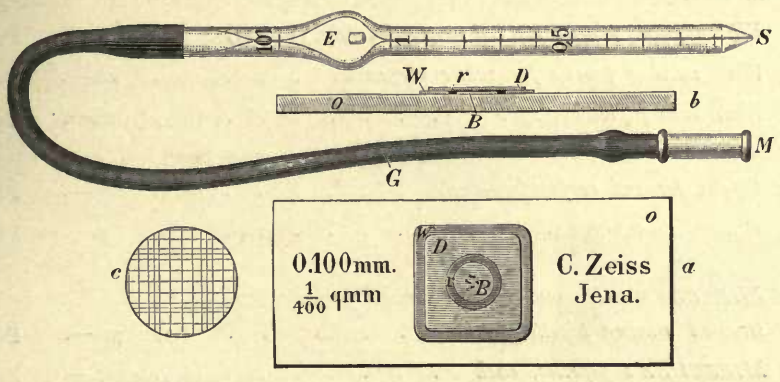


Fig. 55. THOMA's Haemacytometer, No. 147. (2/3 Full Size.)
a and *b* counting chamber, *c* a portion of the ruled bottom (magnified 30 ×), *S M* THOMA's mixing pipette for red blood-corpuscles.

such chamber — No. **142** — contains 400 squares, each having an area of $^1/_{400}$ square millimetre. The volume of fluid resting on each square is thus exactly $^1/_{4000}$ cubic millimetre when a perfectly level cover-glass is laid closely on top of the cell. For counting with low powers we supply cover-glasses 0.6 or 0.4 mm thick, but with higher powers (lenses having a focal length of 4, or of less than 4 mm) excessive thickness precludes their use. As, however, it is often necessary to subject specimens to examination under such high powers, we supply cover-glasses having a thickness of 0.18 mm, perfectly plane on one side and having their other side cemented to a stout conical glass cell.

In conjunction with the counting chamber we supply various accurately calibrated mixing pipettes for diluting the blood, &c. (see Directions for Use).

Further information regarding the variety of forms of the divisions of squares in our counting chambers and the various classes of mixing pipettes are contained in a separate pamphlet dealing with such appliances, copies of which may be obtained on application.

To facilitate the gradual movement of counting chambers on stands not fitted with a mechanical stage we construct a very simple **Movable Stage for the Counting Chamber,** by means of which the chamber is slowly moved in one direction by a screw.

		Prices:	Code-words:
No. **142**:	*Counting Chamber (cross-line stage micrometer) incl. the two cover-glasses, No.* **145,** *in case*	*Marks 15.—.*	**Pedro.**
„ **145**:	*Cover-glasses, 0.4 or 0.6 mm thick, each* . . .	„ *0.75.*	**Peguera.**
„ **146**:	„ „ *0.18 mm thick with cemented glass cell*	„ *3.—.*	**Pegujar.**
	THOMA's **Haemacytometer** (Fig. 55) *complete, in case:*		
„ **147**:	*With mixing pipette for red corpuscles (fig. 55, SM)*	„ *26.—.*	**Peinada.**
„ **148**:	*With mixing pipette for white corpuscles* . . .	„ *26.—.*	**Peine.**
„ **149**:	*With both pipettes*	„ *36.—.*	**Peirayo.**
„ **150**:	*Pipette for red corpuscles, each*	„ *9.—.*	**Pejepalo.**
„ **151**:	„ „ *white* „ „	„ *9.—.*	**Pelada.**
„ **152**:	*MIESCHER's Haemacytometer with specially constructed mixing pipette, in case*	„ *32.—.*	**Pelafustan.**
„ **153**:	*MIESCHER's pipettes, each*	„ *14.—.*	**Pelambre.**
„ **154**:	*Movable Stage for the Counting chamber* . . .	„ *15.—.*	**Pelamesa.**

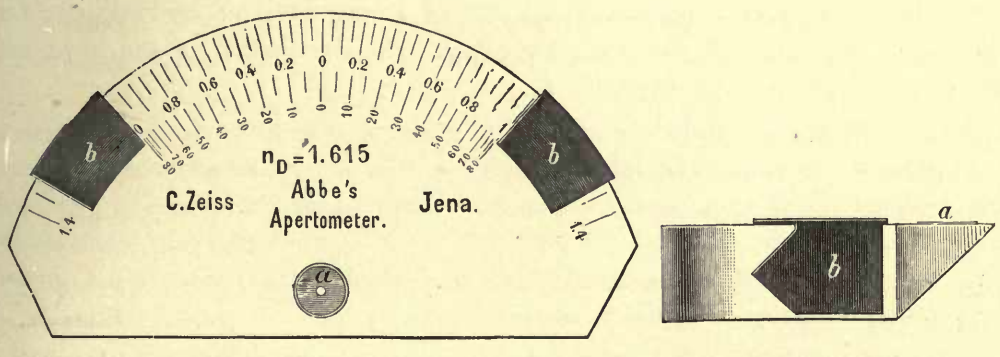
C. Apertometer, Test-plate, Diffraction Apparatus.

*ABBE's Apertometer.

A simple apparatus for determining the numerical and angular aperture of objectives — the **Apertometer** — was designed by Professor ABBE in 1876. It is adapted for any large or medium stand fitted with a draw-tube. A low-power objective of about 40 mm focal length, which screws into the lower extremity of the draw-tube, is supplied with the instrument, but under appropriate stopping the BERTRAND lens may, with Mineralogical Stand I^{b}, be used instead. The auxiliary microscope, formed by the combination of the low-power objective with the eye-piece, being focused upon the emerging pupil of the objective to be examined, the numerical aperture of the latter may be read off the apertometer by means of two movable metal indicators.

Further particulars regarding the principles of construction of the apparatus and the method of measuring with it are contained in the "Journ. of the R. Micr. Soc." (1), vol. I, 1878, pp. 19—22 and (1), vol. III, 1880, pp. 20—31; see also DIPPEL, "Das Mikroskop", vol. I, pp. 348—352, and the directions accompanying the instrument.

We supply **two different patterns of the apertometer;** in the form shown in Fig. 56 the indicators move upon the glass disk direct, whereas in the second



View from above. Side view.

Fig. 56.
Apertometer, No. 155.

model the glass disk is mounted upon a metal plate with a slot for the more certain and more convenient adjustment of the indices.

		Prices:	Code-words:
No. **155**:	*Simple Apertometer, in case*	*Marks 70.—.*	**Pelar.**
„ **156**:	*Apertometer with slot to guide movement of indices*	„ *90.—.*	**Pelaza.**

*ABBE's Test-Plate.

A **Test-plate** for testing lenses with respect to spherical and chromatic aberrations and for estimating that thickness of the cover-glass which corresponds to the most perfect correction was designed by Professor ABBE in 1873. Used in conjunction with the ABBE Illuminating-apparatus and by establishing the so-called sensitive rays, it gives the greatest prominence to any existing faults of correction.

This test-plate consists of an object carrier with six cover-glasses of accurately determined thickness (0.09 mm to 0.24 mm) cemented side by side. These cover-glasses are silvered on their lower surfaces and engraved with lines, the serrated edges of which form the test-object proper.

No. **157**: *ABBE's Test-plate, in case . . Price: Marks 10.—.* Code-word: **Peleador.**

See "Archiv f. mikr. Anat.", vol. IX, 1873, pp. 434—437; also DIPPEL "Das Mikroskop", vol. I, p. 340, and the directions accompanying the test-plate.

*ABBE's Diffraction Apparatus.

The **Diffraction Apparatus** perfected by Professor ABBE in 1876 serves to demonstrate the effects of diffraction in the formation of microscopical images. It consists of a diffraction-plate and a set of stops, with an arrangement for fitting and rotating them above the objective. The dimensions of the stops are such as to adapt them for objective **aa**.

The **diffraction-plate** consists of a glass slip with three cover-glasses cemented side by side. The lower surfaces of the latter are silvered and have groups of lines ruled upon them so as to form various simple and crossed gratings.

		Prices:	Code-words:
No. **158**:	*Diffraction Apparatus*	*Marks 20.—.*	**Pelele.**
„ **159**:	*Diffraction-plate separately, in case*	„ *8.—.*	**Pelicabra.**

See "Monthly Micr. Journ.", vol. XVII, 1877, pp. 82—88; DIPPEL "Das Mikroskop", vol. I, pp. 147—156; ZIMMERMANN "Das Mikroskop", Vienna, 1895, pp. 46—51.

D. Appliances for microscopic examination in polarized light.

Polarizers and Analyzers.

As a rule we supply **polarizers** with end-surfaces inclined to the optical axis of the microscope. That having an aperture of 10 mm — **Polarizer I** — is intended for use with the ABBE illuminating apparatus, and the mount of the prism is flanged so as to fit into the diaphragm-carrier of the condenser, Fig. 57. It may be fixed there — if necessary — by means of a clamping ring. Selenite and mica films may be placed upon the plate-shaped rim of the mount.

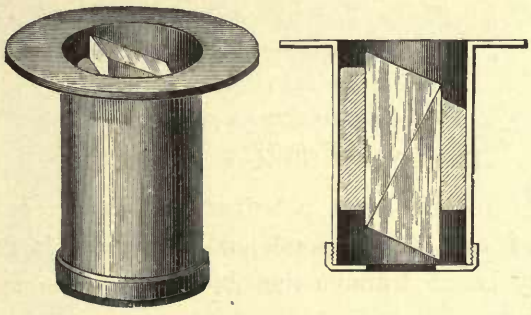


Fig. 57.
Polarizer I, No. 160.
(Full Size.)

The second form of polarizer — **Polarizer II** — has an aperture of 8 mm. It is always supplied in conjunction with the condenser system for small stands, No. **41**, but without iris-diaphragm, and it fits in the same way into the sliding sleeve of the cylinder-diaphragm.

		Prices:	Code-words:
No. **160**:	*Polarizer* **I**	*Marks 22.—*.	**Pelicula.**
„ **161**:	„ **II** *with condenser of num. aperture 1.0 (without iris-diaphragm)* . . .	„ *25.—*.	**Pelito.**

The **Analyzers** supplied by us are, as a rule, prisms of 6 mm aperture with their top and bottom faces at right angles to the microscope axis. The mount of **Analyzer I** is so arranged that the prism fits immediately upon the eye-piece (see Fig. 30). **Analyzer II** is fitted with a divided circle attached to the tube, above which the prism revolves (see Fig. 24 and 34).

The upper part of these analyzers can be screwed upon projection eye-pieces **2** *and* **4** *(but not upon projection eye-piece* **2****) after the cap of the eye-lens has been removed. For projection with polarized light we supply an additional analyzer which, by means of an adapter, is placed immediately above the objective.*

		Prices:	Code-words:
No. **162**:	*Analyzer* **I** *(without divided circle)*	*Marks 15.—.*	**Pelmazo.**
„ **163**:	„ **II** *(with „ „)*	„ *30.—.*	**Pelon.**
„ **164**:	„ *with adapter, to insert above objective* . .	„ *25.—.*	**Pelosa.**

In addition to the above we supply the ***Abbe Analyzer Eye-pieces.** These consist of an analyzer of special construction situated between the lenses of Huygenian eye-piece **2** or compensating eye-piece **4**. These eye-pieces, too, may be fitted with divided circles.

		Prices:	Code-words:
No. **165**:	*Analyzer Eye-piece* **I**, *Huygenian eye-pieces* **2** *or* **3** *(without divided circle)* .	*Marks 40.—.*	**Pelotear.**
„ **166**:	„ „ **II** *(with „ „)* .	„ *55.—.*	**Peloton.**
„ **167**:	„ „ **III**, *Compensating eye-piece* **4** *(without divided circle)*	„ *53.—.*	**Peltre.**
„ **168**:	„ „ **IV**, *Compensating eye-piece* **4** *(with divided circle)*	„ *68.—.*	**Peluca.**

We always add to the usual polarizer and analyzer with divided circle belonging to Stands **I^b** and **IX^b** a second analyzer, which is fitted into a slide so as to be conveniently inserted above the objective.

Only those of the remaining stands which are fitted with movable stages, viz: Stands **I^a**, **I^c**, **II^a** *and* **VI^b**, *are suitable for microscopic examination in polarized light. The use of polarizing appliances with stands having fixed stages cannot be recommended.*

Combinations of Polarizers and Analyzers, in special cases:

1. for Stands **I^a**, **I^c** and **II^a**.

		Prices:	Code-words:
No. **169**:	*Polarizer* **I**, *No.* **160**, *and Analyzer* **II**	*Marks 58.—.*	**Pelusilla.**
„ **170**:	„ **I**, „ **160**, „ „ **I**	„ *41.—.*	**Pena.**
„ **171**:	„ **I**, „ **160**, „ *ABBE Analyzer Eye-piece* **II**	„ *83.—.*	**Penador.**
„ **172**:	„ **I**, „ **160**, „ „ „ „ **I**	„ *66.—.*	**Pename.**

2. for Stand **VI^b**.

		Prices:	Code-words:
No. **173**:	*Polarizer* **II** *and Analyzer* **II**	*Marks 61.—*.	**Pencazo.**
„ **174**:	„ **II** „ „ **I**	„ *44.—*.	**Pendado.**
„ **175**:	„ **II** „ *ABBE Analyzer Eye-piece* **II** .	„ *86.—*.	**Pendencia.**
„ **176**:	„ **II** „ „ „ „ **I** .	„ *69.—*.	**Pendiente.**

Appliances for observing axial images.

With the large **Mineralogical Stand I^b** a **BERTRAND lens,** which is inserted through an opening in the outer tube, forms the objective of an auxiliary microscope for observing axial images. For the same purposes we provide a special auxiliary — the so-called **Axial-image Eye-piece,** No. **177** (see Fig. 58) — to be used in conjunction with our other stands. This auxiliary microscope consists of a HUYGENIAN eye-piece **2** with sliding eye-lens combined with an objective formed of two single lenses. The lower one of these lenses slides in a tube and can thus be focused with respect to the upper focal plane of the objective.

Code-word:

No. **177**: *Axial-image Eye-piece* . . . . . *Price*: *Marks 30.—*. **Pendola.**

For examining and accurately identifying the axial images of small crystals we supply **CZAPSKI's *Iris-diaphragm with Eye-piece,** No. **178,** Fig. 59, which fits into the tube.

Fig. 58.
Axial-image Eye-piece, No. 177.
(1/2 Full Size.)

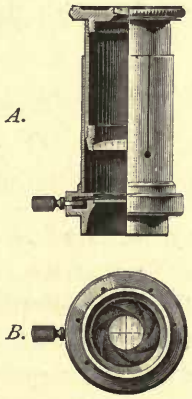


Fig. 59.
Iris-diaphragm with Eye-piece, to fit into tube, No. 178.
A. Longitudinal section and side elevation.
B. Iris-diaphragm viewed from above.
(1/2 Full Size.)

It consists of a small iris-diaphragm fitting into the upper end of the tube and a RAMSDEN eye-piece. This latter slides in a sleeve and is adjustable so as to have the iris-opening in its focus. A glass disk with crossed lines lies immediately below the iris-diaphragm. The crystal to be examined having been accurately centred by means of the eye-piece and the other portions of the image cut off by the iris-diaphragm, the eye-piece is then removed and for the purpose of observing the axial image the analyzer put into its place, or an analyzer, if otherwise fitted to the tube, put into operation.

	Price:	Code-word:
No. **178**: *CZAPSKI's Iris-diaphragm with Eye-piece . .*	*Marks 25.—.*	**Pendra.**

Crystal Films and Plates for determining the character of double refraction and the directions of extinction.

Selenite and Mica Films. We supply regularly **selenite films** of four different thicknesses which, placed between crossed Nicol prisms, show Red of the I., II., III. and IV. Order; also four different **mica films** which are graduated so as to produce differences of phase equal to $^1/_8\ \lambda$, $^1/_4\ \lambda$, $^3/_8\ \lambda$ and $^1/_2\ \lambda$.

These 8 films compose the **set of selenite and mica films** originally proposed by **H. v. MOHL** for the examination of plant cells in polarized light. If not ordered otherwise, we issue the films mounted on paper disks, adapted for Polarizer **I** in connection with the ABBE illuminating apparatus.

	Prices:	Code-words:
No. **179**: *MOHL's Set of Films . . . . . .*	*Marks 15.—.*	**Peneque.**
Single films mounted on paper:		
„ **180**: *Selenite films, Red of the I. Order, each . .*	„ *3.—.*	**Penetrar.**
„ „ „ „ *other Orders* „ . .	„ *2.—.*	
Mica films, each	„ *1.50.*	

We also supply the same films in metal mounts either for putting into the slide above the objective, as adapted for the Mineralogical Stands **I^b** and **IX^b**, or for insertion between the eye-piece and analyzer on Stand **VI^b**.

Single films in metal mounts:
for Stands **I^b** and **IX^b**

	Prices:	Code-word:
No. **181**: *Selenite films, Red of the I. Order, each . .*	*Marks 4.—.*	**Penible.**
„ „ „ „ *other Orders,* „ . .	„ *3.—.*	
Mica films, each	„ *2.50.*	

for Stand **VI^b**

	Prices:	Code-word:
No. **182**: *Selenite films, Red of the I. Order, each*	*Marks 4.—.*	**Peninsula.**
„ „ „ „ *other Orders* „	„ *3.—.*	
Mica films, each	„ *2.50.*	

A selenite film for Red of the I. Order generally meets all requirements.

BRAVAIS's Double Selenite Film. In this case two semi-circular films for Red of the I. Order are so arranged side by side that the equal axes of optical elasticity are at right angles to each other and form angles of 45° to the boundary line.

These compound films are only supplied in conjunction with eye-pieces having an adjustable eye-lens.

	Prices:	Code-words:
No. **183**: *HUYGENIAN Eye-piece* **2** *or* **3** *with BRAVAIS Double Film*	*Marks 30.—.*	**Penitente.**
„ **184**: *Compensating Eye-piece* **4** *with BRAVAIS Double Film*	„ *43.—.*	**Pensadero.**

BIOT-KLEIN's Quartz Plate, No. **185.** This is a plate of quartz 3.75 mm thick and cut perfectly perpendicularly to the axis. It is always supplied with Stands **I^b** and **IX^b** and, being set in a metal mount, is handy for placing into the slide fitted above the objectives of those stands.

No. **185**: *BIOT-KLEIN Quartz Plate . . . Price: Marks 6.—.* Code-word: **Pension.**

BERTRAND's quadruple Quartz Plate. Four quadrant-shaped quartz plates, cut perpendicularly to the axis, are cemented together so that their dividing lines form the shape of a cross. Two of the plates are composed of quartz with rotatory power directed to the right, the other two of crystals having the opposite rotation.

This plate is only supplied with eye-pieces having adjustable eye-lenses.

	Prices:	Code-words:
No. **186**: *HUYGENIAN Eye-piece* **2** *or* **3** *with BERTRAND Quartz Plate*	*Marks 35.—.*	**Pentagrama.**
„ **187**: *Compensating Eye-piece* **4** *with BERTRAND Quartz Plate*	„ *48.—.*	**Penultima.**

Stauroscopic Calc-spar Plate, No. **188.** A plate of calc-spar, cut perpendicularly to the axis, mounted so as to be readily inserted between eye-piece and analyzer.

No. **188**: *Stauroscopic Calc-spar Plate . . . . Price: Marks 7.—.* Code-word: **Peonada.**

For particulars of **ROLLETT's Spectro-Polarizer,** No. **35,** see p. 32.

With regard to **cross-line eye-pieces** refer to p. 108.

E. Miscellaneous Accessory Apparatus.

Eye-pieces for special purposes.

***Abbe's Stereoscopic Eye-piece**, No. **189**, Fig. 60. This apparatus is designed for stereoscopic as well as ordinary binocular observation of microscopical objects with any desired magnification. (See "Carl's Repertorium", vol. XVII, 1881, pp. 197—224; also "Journ. of the R. Micr. Soc." (2), vol. I, 1881, pp. 203—211.)

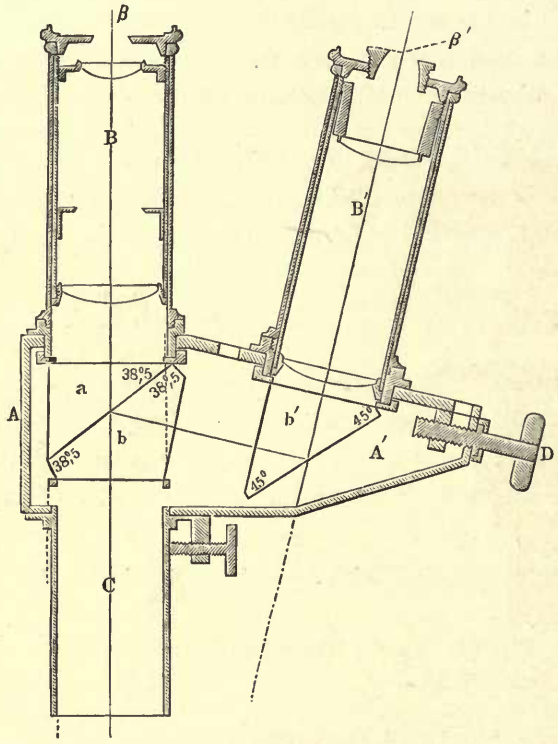


Fig. 60. Abbe's Stereoscopic Eye-piece, No. 189. (⅔ Full Size.)

The division of the pencil of rays emerging from the objective, with the object of producing two separate images, is effected at the upper end of the tube by partial reflection at a thin stratum of air between the two prisms *a* and *b*. The bisection of the pencils for producing stereoscopic effect is made by adjustable semi-circular stops placed over the eye-pieces; without these, i. e., with fully exposed eye-pieces, the instrument gives binocular vision without specific stereoscopic effect.

The distance between the eye-pieces is adjustable — by altering the position of one of the eye-piece tubes — to suit the intra-pupillary range of any individual observer's eyes. The instrument is available (but in conjunction with achromatic objectives only) for use on any of our large stands in which the tubes admit of shortening to at least 140 mm ($5^1/_2$ in.).

No. **189**: *ABBE's Stereoscopic Eye-piece, Price, incl. case Mk. 180.—.* Code-word: **Peonia.**

***ABBE's Spectroscopic Eye-piece (Micro-Spectroscope),** No. **190,** Fig. 61.

This eye-piece is specially designed for the examination of the absorption spectra of microscopic objects, but is also adapted for spectroscopic analysis of larger objects, liquid strata, &c.

The achromatic eye-lens is accurately adjustable with respect to the slit situated in the plane of the diaphragm. By a lever arrangement a comparison prism can be applied to the slit to facilitate spectroscopic comparison of the object with other absorption media, which are attached in suitable holders at the side of the eye-piece. An assortment of small glass tubes is supplied for this purpose.

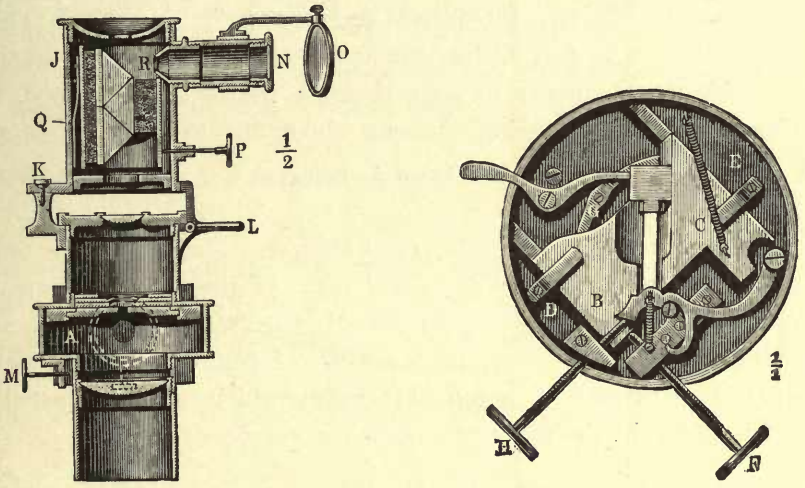


Fig. 61. ABBE's Micro-Spectroscope, No. 190.

Longitudinal section of the whole instrument. ($^1/_2$ Full Size.)

Slit Mechanism separately. (Plan view, Full Size.)

A direct-vision AMICI prism, which may be turned aside about a pivot, is placed above the eye-piece. A scale of wave-lengths is projected upon the spectrum by means of a tube, with mirror and lens, attached at the side of the prism casing.

The instrument is inserted in the tube in place of the ordinary eye-piece.

For fuller particulars regarding its construction see the directions accompanying the instrument.

No. **190**: *ABBE's Spectroscopic Eye-piece, incl. case . Mk. 200.—,* Code-word: **Peorus.**

***ENGELMANN's Micro-Spectro-Photometer,** No. **191.** This apparatus — designed for quantitative micro-spectrum analysis — is constructed on the principle of VIERORDT's spectro-photometers.

A short description of the instrument may be obtained on application, in addition to which we would refer to the "Zeitschr. f. wissen. Mikrosk.", vol. V, 1888, pp. 289—296.

Price, incl. case: Marks 480.—. Code-word: **Pepino.**

***Drum fitted with PORRO's Prisms for erecting the images,** No. **192.** Similarly as in our binocular microscopes of GREENOUGH's design the PORRO prisms of this eye-piece are encased in a drum, below which is a sleeve fitting the tube of the microscope. A second sleeve on the upper end of the drum takes any eye-piece desired.

With regard to the use of this instrument on Dissecting Stand **P II** *see p. 79.*

Price (without eye-piece), incl. case: Marks 40.—. Code-word: **Pepitoso.**

AMICI Erecting Prism ("prisme redresseur"), No. **193.** This prism, which is supplied in a mount fitting the eye-piece, besides erecting the image affords the additional advantage of a comfortable position of the head, the optic axis (the direction of vision) being inclined about 30° to the axis of the tube.

Price, incl. case: Marks 25.—. Code-word: **Peragrar.**

***Index Eye-pieces.** In the course of class demonstrations it is often found desirable to be able to mark any particular point of the object by means of an index. To meet this want we supply the HUYGENIAN eye-pieces **2** and **3,** as also compensating eye-piece **6** — in the form of drum eye-pieces with micrometer (see p. 93) — fitted with a **movable index** which can be adjusted laterally by means of a screw in the same manner as a micrometer scale.

	Prices:	Code-word:
No. **194**: *HUYGENIAN Eye-piece* **2** *or* **3** *with drum and index, in case*	*Marks 36.—.*	**Peraleda.**
„ **195**: *Compensating Eye-piece* **6** *with drum and index, in case*	„ *49.—.*	**Peranton.**
„ **195a**: *Index separately, each*	„ *1.—.*	**Percance.**

Cross-line Eye-pieces. The process of centring the object-stage or the objective by means of special centring appliances requires that the centre of the field should be indicated by a mark in the plane of the diaphragm of the eye-piece. For this purpose we supply **glass disks ruled with a cross** for dropping into the eye-piece,

The addition of such a disk raises the price of an eye-piece by Marks 3.—. If it be also desired to have the eye-lens adjustable as in micrometer eye-pieces (see p. 92), a further charge of Marks 6.— is to be added, so that the price of an eye-piece with cross-lines and adjustable eye-lens would be Marks 9.— higher than that of the same eye-piece without these fittings.

*GREENOUGH's Prism and Capillary Rotators.

These two instruments, constructed in accordance with Mr. GREENOUGH's suggestions, are more especially designed to facilitate the examination, from different sides in succession, of objects so small that the control of their movements under the microscope would be difficult to accomplish by hand.

The **Prism-rotator,** Fig. 62, a and b, serves to achieve this object in a simple manner by single or multiple reflection. The upper surface of the object is seen direct, the lower side is viewed after double reflection (see Fig. 62 b) at s_1 and s_2, while rotation round the axis AA and reflection at s_3 facilitate examination of all remaining portions of the object.

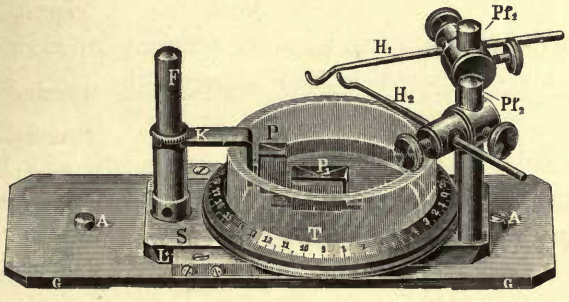
Price: Code-word:

No. **196**: *Prism-rotator with single side-view reflection, incl. case* *Marks 62.—.* **Perceptor.**

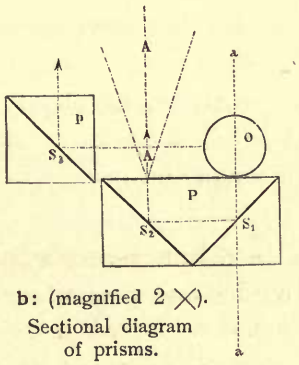
The positions of "right" and "left" being reversed in consequence of the single reflection at s_3, and as this would cause inconvenience in certain cases, we construct a second form of the instrument in which the objectionable reversal is obviated by the addition of another prism.

Price: Code-word:

No. **197**: *Prism-rotator with double side-view reflection, incl. case* *Marks 75.—.* **Percudir.**



a (2/3 Full Size).



b: (magnified 2 ×). Sectional diagram of prisms.

Fig. 62. Prism-rotator, No. 196.

The **Capillary Rotator,** No. **198**, Fig. 63, serves to rotate about a horizontal axis small objects which may be contained in a capillary tube. The instrument is so arranged that the capillary tubes may be rotated within a chamber fitted with cedar-wood oil, so as to obviate the disturbing effects of irregular refraction and of reflection caused by the walls of the tubes.

No. **198**: *Capillary Rotator, incl. case, Price: Marks 50.—.* Code-word: **Perderas.**

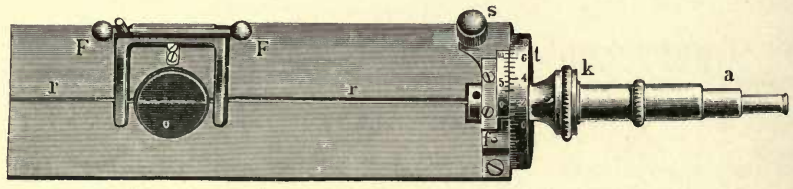


Fig. 63. Capillary Rotator, No. 198. ($^3/_5$ Full Size.)

While the prism-rotator is primarily designed for use on Binocular Stand **X**^{a}, but may also be used with other stands having a stage opening 33 mm ($1^1/_3$ in.) in diameter, the capillary rotator, because it may be held by means of clips like any ordinary object-carrier, is adapted for all stands alike.

Regarding the details of the construction of the two instruments see "Zeitschrift f. wiss. Mikrosk.", vol. XIV, 1897, pp. 304—312, and also the directions for using the instruments.

Artificial Illuminating Appliances for the Microscope.

Lamplight, if properly regulated, may almost completely replace good daylight.

It is advisable to interpose between the source of light and the mirror of the microscope a spherical glass flask filled with water (such as is sometimes used by Engravers) or, better still, a simple collective lens, so as to project a sufficiently large image of the source of light upon the iris-opening or upon the mirror.

This **flask,** of about 15 cm (6 in.) diameter, is most efficient when it is placed so as to be an at equal distance (about 6 inches) between the lamp and the mirror of the microscope.

We construct special **stands,** which are supplied either separately with the flasks or together with an **incandescent gas lamp** on brass stand with ordinary burner and Jena glass chimney and 2 spare mantles.

	Price:	Code-words:
No. **199**: *Lamp and spherical flask on stand . . . .*	*Marks 22.—.*	**Perdidoso.**
„ **200**: *Spherical Flask on stand separately . . . .*	„ 7.—.	**Perdigon.**

Latterly we have added to our list a simple form of **collective lens** of about 125 mm (5 in.) focal length, with an **iris-diaphragm attached to the mount.** It stands upon a massive foot and is adjustable in elevation. This appliance helps, not only to produce a better image of the source of light, but also to confine the illuminated portion of the field within sharply defined limits. It is for this reason that it is so well adapted for illumination by means of the vertical illuminator (see p. 36).

	Price:	Code-word:
No. **201**: *Collective Lens, with Iris-diaphragm, on stand* .	*Marks 30.—.*	**Perdon.**

Spectroscope and Saccharimeter.

Browning's Hand-Spectroscope.

This form of spectroscope is fitted with a set of Amici prisms of great dispersion and is principally intended for the examination of large objects as, for instance, troughs filled with liquid matter. It is supplied in three different patterns, viz:

		Code-words:
No. **202**: Without **comparison prism,**		
	Price, incl. case: Marks 40.—.	**Perdurar.**
„ **203**: With **comparison prism,**		
	Price, incl. case: Marks 46.—.	**Peregrina.**
„ **204**: With **scale of wave lengths.**		
	Price, incl. case: Marks 80.—.	**Perenal.**

For particulars of other spectroscopes see our Catalogues of Optical Measuring Instruments.

Hand-Saccharimeter, Fig. 64.

This instrument is only suitable for fluids containing but a small percentage of sugar and is principally intended for the rapid and convenient examination of urine.

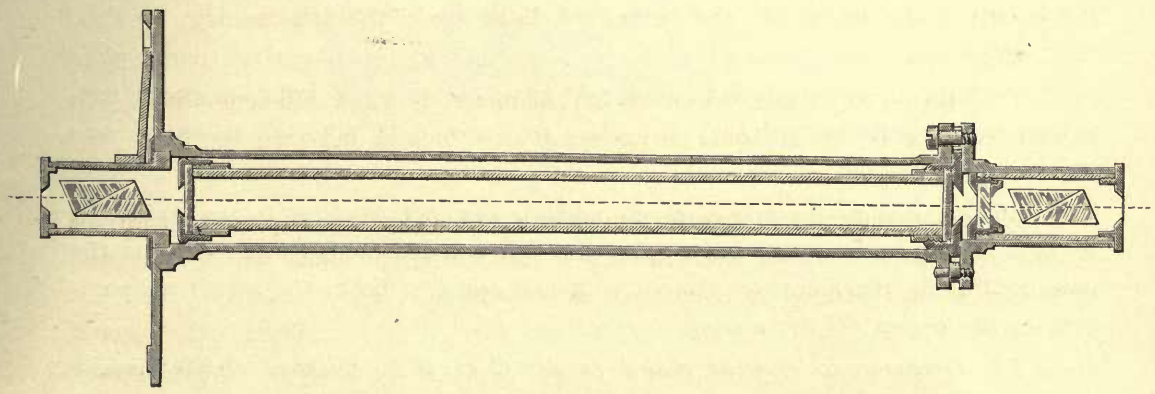


Fig. 64. Saccharimeter, No. 205. (1/2 Full Size.)

The tube containing the fluid — 200 mm (8 in.) in length — slides in a brass tube which carries a polarizer and double quartz plate at one end, the other end being fitted with a circle divided in $^1/_1$ degrees, over which an analyzer with vernier can be rotated. Observation is made by adjusting the so-called transition colour in both halves of the quartz plate, the tube being directed by hand upon a white surface. (See directions for using the instrument.)

Also supplied in conjunction with a **small telescope** for the more exact observation of the quartz plate.

If a support be desired, we recommend for the purpose our simple **Saccharimeter Stand provided with a joint, No. 206[a].**

	Prices:	Code-words:
No. **205**: *Hand-Saccharimeter, without telescope, in case* . .	*Marks 90.—.*	**Pereza.**
„ **206**: „ *with* „ „ „ . .	„ *108.—.*	**Perfecto.**
„ **206[a]**: *Saccharimeter Stand provided with joint*	„ *30.—.*	**Perfidia.**
„ **207**: *Glass Tubes separately, with stopper-plates, each* .	„ *7.50.*	**Perfil.**
„ **208**: „ „ „ *without* „ „ .	„ *3.—.*	**Perforar.**

If desired, tubes of 100 mm (4 in.) length may be obtained at the same price as 200 mm tubes.

Heating Apparatus.

L. Pfeiffer's Warm Chamber for heating microscopical objects during observation, Fig. 65. (See L. Pfeiffer "Protozoen als Krankheitserreger &c.", 2nd edition, Jena, 1891.)

The chamber consists of a mahogany box encasing the whole of the microscope, with a window in the front to admit the necessary light. On either side is a closely fitting door through which the specimen can be moved with the fingers. The side walls may also be completely folded back, carrying with them the halves of the back wall, which is divided down the centre.

The whole (chamber and microscope stand) rests upon a thick metal plate on three legs. The metal plate is heated from below by a **micro-burner**, controlled by a **thermo-regulator**, No. **215**, and should be adjusted so as to burn with smokeless flame.

By this means the whole stand and the air surrounding it are gradually brought to the same temperature, so that after a reasonable lapse of time the readings of the thermometer placed in the air space indicate the actual temperature of the object on the stage.

The temperature may be raised to 45° C (113° F) without risk of injury to the stand or lenses.

We supply three different forms of the chamber, viz:

		Price:	Code-word:
No. **209**:	*For Stands* **I**[a] *and* **I**[b]	*Mk.* 70.—.	**Pergolo.**
„ **210**:	„ „ **I**[c]	„ 70.—.	**Perico.**
„ **211**:	„ „ **II** *and* **IV**	„ 60.—.	**Perifolio.**

A thermo-regulator is supplied with the warm chamber but the micro-burner is charged extra.

No. **212**: *Micro-burner, Price: Mk. 4.50.* Code-word: **Perilustre.**

Fig. 65.
L. Pfeiffer's Warm Chamber, No. 211.
(1/6 Full Size.)

We are also prepared to supply **Pfeiffer's Heating Stage** as constructed by E. Leybold's successor, of Cologne. This stage consists of a glass box made by the Leybold sealing process, which may be directly used as an object carrier. A thermometer and inlet and outlet tubes for heated water are fitted at the side of the glass box.

In order that this stage may also be available for hanging-drop observations, we supply the same, if so ordered, with three concavities, ground out of the upper glass surface, upon which the cover-glasses are placed.

	Price:	Code-word:
No. **213**: *Heating stage with smooth surface*	*Mk. 9.—.*	**Perineo.**
„ **214**: „ „ „ *3 concavities*	„ *15.—.*	**Periodo.**
„ **215**: *Thermo-regulator for any of above heating appliances* .	„ *10.—.*	**Periplo.**

ZOTH'S Cooling Trough, which is more especially designed for purposes of micro-projection, may also be fitted with a **thermometer** and will in this form be found to serve as a useful **heating stage.** (See our Catalogue of Photo-micrographic and Projection Apparatus.)

No. **216**: *ZOTH's Cooling Trough, with thermometer* . . . . . *Price: Mk. 18.—.*
Code-word: **Peritoneo.**

Other Accessory Appliances.

MALTWOOD'S Finder, No. **217.** This simple contrivance for refinding certain points of an object consists principally of a grating of separately numbered small squares photographed upon glass. (See "Zeitschr. f. wiss. Mikrosk.", vol. V, 1888, p. 40.)

	Price:	Code-word:
No. **217**: *MALTWOOD's Finder incl. case*	*Mk. 20.—.*	**Perlado.**

BORN and PETER'S Orientation-plate, No. **218,** constructed by us at the suggestion of the gentlemen after whom it is named, serves to mark the position of objects contained in hardening paraffin and at the same time to impress so-called **lines of direction** upon the paraffin blocks. For the latter purpose one side of the plate has several parallel grooves, of equal width and with sharp edges, cut into it.

See "Zeitschr. f. wiss. Mikrosk.", vol. XV, 1898, pp. 31—49.

We generally supply a pair of glass set-squares together with the instrument.

	Price:	Code-word:
No. **218**: *BORN and PETER's Orientation-plate, with pair of glass set-squares*	*Mk. 40.—.*	**Perlongar.**
„ **219**: *Pair of glass set-squares separately*	„ *10.—.*	**Permeable.**

Turn-Table (Tournette), No. **220,** on wood base, for ringing specimens. *Price: Mk. 11.—.* Code-word: **Permitir.**

With regard to the different sizes and prices of slides and cover-glasses refer to p. 140—142.

Price-List.

This schedule contains only the serial numbers and descriptive designations of the various instruments, together with their prices and the code-words to be quoted when ordering by wire.

References are given in all cases to the pages of the general text of the catalogue where detailed descriptions and illustrations may be found.

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Objectives and Eye-pieces.

Apochromatic Objectives. *(See pp. 6—9.)*

	Distinctive Features	Price Marks	Code-word
Dry Series	16 mm equv. Focus 0.30 num. Apert.	80.—	**Pacato**
	12 „ „ „ 0.65 „ „	140.—	**Paflon**
	8 „ „ „ 0.65 „ „	100.—	**Pacetor**
	6 „ „ „ 0.95 „ „	180.—	**Paganismo**
	4 „ „ „ 0.95 „ „	140.—	**Pacer**
	3 „ „ „ 0.95 „ „	160.—	**Paciencia**
Water Immersion	2.5 „ „ „ 1.25 „ „	250.—	**Pacificar**
Homogeneous Immersion	3 „ „ „ 1.30 „ „	300.—	**Pactar**
	3 „ „ „ 1.40 „ „	400.—	**Padilla**
	2 „ „ „ 1.30 „ „	300.—	**Padrastro**
	2 „ „ „ 1.40 „ „	400.—	**Padre**
	1.5 „ „ „ 1.30 „ „	350.—	**Padrino**

With each homogeneous immersion objective we supply free of charge one MACH's oil drop-bottle and about 15 grammes of cedar-wood oil.

Subsequent supplies are charged for at the following rates:

	Price:	Code-word:
Bottle for Immersion Oil with glass cap and rod *(see Fig. 2a, p. 5)*, each . .	*Marks 1.—.*	**Pabellon**
„ „ „ „ with metal cap and rod, MACH's pattern *(see Fig. 2b, p. 5)*, each	„ *1.50.*	**Pabulo**
Cedar-wood Oil, 15 grammes (1/2 oz.) in plain bottle .	„ *0.75.*	**Pacernica**

The two objectives, 12 mm (num. aperture 0.65) and 6 mm (num. aperture 0.95), of the dry series are constructed exclusively for the 10-inch tube (tube-length 250 mm = 10 in.) and are only supplied to special order.

Compensating Eye-pieces. *(See pp. 10—13.)*

	Searcher Eye-piece	Working Eye-pieces					
Eye-piece No.:	2	4	4*	6	8	12	18
Price: Marks	20.—	20.—	40.—	20.—	30.—	30.—	25.—
Code-word:	**Pagina**	**Pagote**	**Paguro**	**Paja**	**Pajada**	**Pajarel**	**Pajaro**

In addition we supply the following three Eye-pieces for the 10-inch tube:

Eye-piece No.:	2e	4e	8e
Price: Marks	25.—	25.—	35.—
Code-word:	**Pajarete**	**Pajarico**	**Pajarillo**

Projection Eye-pieces.

(See new edition of our Catalogue of Photo-micrographic and Projection Apparatus.)

Eye-piece No.:	2	2*	4
Price: Marks	40.—	60.—	40.—
Code-word:	**Pajarota**	**Pajarraco**	**Pajea**

Projection Eye-pieces 2 and 4 are also supplied for the 10-inch tube; their descriptive numbers in this case will become 3 and 6 in accordance with their increased eye-piece magnification when used with a tube-length of 250 mm. The prices remain the same.

When subsequently ordering compensating eye-piece 4* or projection eye-piece 2*, the factory numbers of the stands with which they are to be used should be given.

When ordering eye-pieces for stands constructed by other makers it is necessary to send us an exact impression in sealing-wax of the tube edge, or, better still, to forward the actual tube which the eye-pieces are to fit.

Achromatic Objectives. *(See pp. 14—17.)*

	Designation	Price without Correction-Collar Marks	Price with Correction-Collar Marks	Code-word
Dry Series	a_0	12.—		Pajeria
	a_1	12.—		Pajillo
	a_2	12.—		Pajonal
	a_3	12.—		Pajuncio
	a*	40.—		Pajuela
	aa	27.—		Palabra
	A	24.—		Palacial
	AA	30.—		Palacio
	B	30.—		Paladar
	C	36.—		Paladino
	D	42.—		Palamallo
	DD	54.—	74.—	Palanca
	E	66.— Palamenta	86.—	Palangana
	F	84.— Palampora	104.—	Palastro
		Palatal		
Water Immersion	Pl (Plankton-Searcher)	20.—		Palecer
	D*	75.—		Palente
	H	110.—	130.—	Paletada
		Palatina		
	J	144.—	164.—	Paletero
		Paleton		
Homogeneous Immersion	$\frac{1''}{12}$	160.—		Paliador

With each homogeneous immersion objective we supply free of charge one MACH's oil drop-bottle and about 15 grammes of cedar-wood oil (see page 117).

Glass Trough for Objective Pl (Plankton-Searcher), Price: Marks **3.50.** Code-word: **Pajarita.**

Pairs of Objectives for our Binocular Microscopes. *(See p. 18.)*

Designation:	(55)	(a_0)	(a_2)	(a_3)	(Pl)
Price: Marks	45.—	45.—	45.—	45.—	55.—
Code-word:	**Palido**	**Palinodia**	**Palma**	**Palmado**	**Palmear**

Suitable slip-on diaphragms, to be used when it is desired to have an image uniformly sharp to the margin, are supplied with each set of paired objectives (a_0).

Price of the **Orthomorphic Eye-pieces 4** *(see pp. 19 and 72)*: Marks 7.—.
Code-word: **Palmito.**

HUYGENIAN Eye-pieces. *(See p. 19.)*

Eye-piece No.:	1	2	2*	3	4	5
Price: Marks	7.—	7.—	30.—	7.—	7.—	7.—
Code-word:	**Palmula**	**Palombin**	**Palomero**	**Palota**	**Palpebra**	**Palpitar**

When ordering HUYGENIAN Eye-piece 2* separately the factory number of the stand should be given.

Projection Lenses and Micro-Planars.

(See the new edition of our Catalogue of Photo-micrographic and Projection Apparatus.)

Designation	Equivalent Focus mm	Equivalent Focus in.	Largest relative Aperture	Price Marks	Code-word
Projection Lens	35	$1\,^3/_8$	1 : 7	**35.—**	**Palpotear**
„ „	70	$2\,^3/_4$	1 : 7	**40.—**	**Paludoso**
Micro-Planar, Series I^a, No. 1	20	$^3/_4$	1 : 4.5	**100.—**	**Placage**
„ Series I^a, No. 2	35	$1\,^3/_8$	1 : 4.5	**100.—**	**Placard**
„ Series I^a, No. 3	50	2	1 : 4.5	**100.—**	**Placenta**
„ Series I^a, No. 4	75	3	1 : 4.5	**120.—**	**Placet**
„ Series I^a, No. 5	100	4	1 : 4.5	**120.—**	**Placitum**

Further particulars with regard to the Planars, described above as "Micro-Planars", may be found in the 1901 edition of our Catalogue of Photographic Objectives and Photo-Optical Auxiliary Appliances, pp. 34—41.

No.	Reference to general descriptive text: Page	Fig.	Description of Article	Price Marks	Code-word
			Dissecting-Lenses and Hand-Magnifiers.		
1	22	40 P	**Dissecting Combination-Lens**	**40.—**	**Paludato**
2	23		**Improved Algascope** (Dissecting Combination-Lens, No. 1, with sliding collar and stage)	**48.—**	**Palustre**
2a	„		**Sliding Collar and stage** separately	**8.—**	**Pallar**
			When ordering this sliding collar separately the lens combination must be forwarded for adaption.		
3	„	43	**Large BRÜCKE Dissecting Lens**	**25.—**	**Pampana**
4	„		**Small** „ „ „	**16.—**	**Pampero**
			STEINHEIL's Aplanatic Lenses (old type):		
5	„		Magnification 6 ×	**15.—**	**Pamplina**
6	„		„ 12 ×	**15.—**	**Panace**
7	„	8	„ 20 ×	**12.—**	**Panadizo**
8	„		„ 30 ×	**12.—**	**Panal**
			Improved Aplanatic Lenses:		
9	24	9	Magnification 6 ×	**18.—**	**Pancada**
10	„		„ 10 ×	**18.—**	**Pandear**
			The same in the form of **Folding lenses:**		
11	„	10	Magnification 6 ×	**21.—**	**Pancreas**
12	„		„ 10 ×	**21.—**	**Pandereta**
			Doublets:		
13	25		Magnification 15 ×	**6.—**	**Pandorga**
14	„		„ 30 ×	**6.—**	**Panecilla**
			Simple Magnifiers:		
15	„		in brass mounts	**6.—**	**Panera**
16	„		in plainer mounts	**5.—**	**Panfilo**
17	„		**Achromatic Pocket Magnifier (Folding)** . .	**12.—**	**Panico**
18	„		**Algascope**	**8.—**	**Pantano**

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No.	Reference to general descriptive text		Description of Article	Price Marks	Code-word
	Page	Fig.			
19	25	8	**Handle with ring** for lenses, Nos. 5—10, each	**3.—**	**Pano**
20	„		**Tripod** for lenses, Nos. 9 and 10, each . . .	**3.—**	**Panoso**
			When ordering lenses separately, which are to be used on dissecting stands or lens-holders, the type of stand or holder should be mentioned to enable us to supply any necessary holders and adapters.		
			All lenses, except those of the folding pattern, are supplied in wooden capsules, engraved with the name and magnification of the lens.		
			## Illuminating Appliances.		
			### Diaphragms and condensers which may be used with the ABBE Illuminating Apparatus.		
21	28	11c	**Cylinder-diaphragm** fitted with 3 stops	**4.—**	**Pantografo**
22	„		**Iris-cylinder diaphragm**	**14.—**	**Pantuflo**
23	29		**Iris-diaphragm** to fit into the diaphragm-carrier	**10.—**	**Panzudo**
24	„		**Stops for dark-ground illumination:**		
			a) Central-stop diaphragm with button for the central stops	**0.50**	**Papado**
			b) Central stops, each	**1.—**	**Papagallo**
			c) Objective-stops for achromatic lenses (to screw into the mount), each . .	**0.60**	**Papalina**
			d) Objective-stops for apochromatic lenses (for placing into the lens mount), each	**1.50**	**Papanatas**

No.	Reference to general descriptive text		Description of Article	*Price Marks*	*Code-word*
	Page	Fig.			
			Ordinary Condenser in sliding sleeve		
25	29	11[a]	double combination, num. aperture 1.20	20.—	**Papaga**
26	„	11[b]	triple combination, „ „ 1.40	25.—	**Papelear**
			Swing-out Condenser with iris-cylinder diaphragm		
27	30		double combination, num. aperture 1.20	45.—	**Papeleta**
28	„	12	triple combination, „ „ 1.40	50.—	**Papenco**
29	„	11[d]	**Centring Achromatic Condenser,** num. aperture 1.0	75.—	**Paplon**
30	„		**ROLLETT's Centring Achromatic Condenser,** num. aperture 1.0, **having great focal distance,** in case	100.—	**Papula**
31	„	11[e]	**Centring Achromatic Condenser,** num. aperture 1.30, in case	100.—	**Pacquira**
32	32	11[f]	**Centring Appliance for microscope objectives** which are to be used as condensers .	12.—	**Parabanda**
33	„		**HARTNACK's Illuminating Apparatus for monochromatic light,** in case	120.—	**Paradero**
34	„		**ENGELMANN's Micro-Spectral Objective,** in case	160.—	**Paradigma**
35	„		**ROLLETT's Spectro-Polariser,** as modified by **DIPPEL,** in case	200.—	**Paradura**
36	„		**Centring Appliance for the apparatus specified under Nos. 33—35**	6.—	**Parafraste**
			Illuminating Appliances for Stand IV[b]		
			Simplified Illuminating Apparatus		
37	34		Condenser, num. aperture 1.20, in sliding sleve with centrally fixed iris-diaphragm	30.—	**Parafuego**
38	„		Swing-out Condenser, num. aperture 1.20, with centrally fixed iris-diaphragm	55.—	**Paraguas**

No.	Reference to general descriptive text: Page	Reference to general descriptive text: Fig.	Description of Article	Price Marks	Code-word
			Diaphragms and Illuminating Apparatus for Stands VI, VII.		
39	34		**Cylinder-diaphragm** fitted with 3 stops .	2.—	Paralaje
40	„	13	**Iris-cylinder diaphragm**	8.—	Paralelo
41	35	14	**Illuminating Apparatus,** double combination, num. aperture 1.0, in sliding sleeve with centrally fixed iris-diaphragm	22.—	Paralizar
			Illuminating Appliances for observation with light from above.		
42	36	15	**Vertical Illuminator**	18.—	Paramento
43	37 & 76	37 B	**Illumination by means of an incandescent lamp,** applicable to Stand **X^{c}** (Corneal Microscope), incl. 3 spare lamps	36.—	Parangon
			Mechanical Stages.		
44	38	16	**Large Mechanical Stage for Stands I^{a}, I^{b}, I^{c}**	100.—	Paranza
45	„		**Revolving Vulcanite Stage,** interchangeable on Stands **I^{a}** and **I^{c}** with the large mechanical stage	25.—	Parar
46	39	17	**Attachable Mechanical Stage (old form)**	85.—	Parasito
46^{a}	„		Case to contain No. 46	5.—	Parazonio
47	„	18	**Attachable Mechanical Stage (new pattern)**	120.—	Pareial
47^{a}	40		Case to contain No. 47	5.—	Pareidura
			The small attachable mechanical stages (Nos. 46 and 47) can be fitted to Stands **II^{a}**, **IV^{a}** and **IV^{b}** without special adaptation.		
			Appliances for changing the Objectives on the Stand.		
			Revolving Nose-pieces		
48	47	20	for 2 objectives	20.—	Pardal
49	„	„	„ 3 „	27.—	Pardina
50	„	„	„ 4 „	32.—	Pardogris
51	„		**Clamping-ring for Stand VII, required when using a revolving nose-piece on that stand** .	3.—	Pared

No.	Reference to general descriptive text		Description of Article	*Price Marks*	*Code-word*
	Page	Fig.			
			Sliding Objective-changers		
52	47	21[a]	Tube-slide	10.—	**Pareja**
53	48	21[b]	Objective-slide, each	10.—	**Parental**
54	49		**Leather Cases to hold 3 objective-slides with objectives**	6.—	**Parhilera**
55	„	22	**Lock-up Mahogany Case for 6 objective-slides with objectives**	15.—	**Parida**
			Stands.		
			A. Monocular Stands.		
			Stand I[a], with revolving and centring vulcanite stage		
56	50		with ordinary condenser, num. aperture 1.40	300.—	**Pariente**
57	„		with swing-out condenser, num. apertur 1.40	325.—	**Parietale**
			Stand I[a], with large centring mechanical stage		
58	„	23	with ordinary condenser, num. aperture 1.40	375.—	**Parizon**
59	„		with swing-out condenser, num. aperture 1.40	400.—	**Parlador**
			Stand I[b] (Large Mineralogical Stand), with revolving, permanently centred stage		
60	52	24	with ordinary condenser, num. aperture 1.40	500.—	**Parlanchin**
61	„		with swing-out condenser, num. aperture 1.40	525.—	**Parlerito**

No.	Reference to general descriptive text		Description of Article	Price Marks	Code-words
	Page	Fig.			
			Stand I^{b}, with large (not centring) mechanical stage		
62	52		with ordinary condenser, num. aperture 1.40	575.—	Parnasso
63	„		with swing-out condenser, num. aperture 1.40	600.—	Parola
			Stand I^{c} (for Photo-micrography and Projection), with revolving and centring vulcanite stage		
64	54		with ordinary condenser, num. aperture 1.40	325.—	Parotlda
65	„		with swing-out condenser, num. aperture 1.40	350.—	Parpasola
			Stand I^{c}, with large centring mechanical stage		
66	56		with ordinary condenser, num. aperture 1.40	400.—	Parrafo
67	„		with swing-out condenser, num. aperture 1.40	425.—	Parrilla
			Stand I^{c}, with photo-micrographic stage		
68	„	25	with ordinary condenser, num. aperture 1.40	400.—	Parroquia
69	„		with swing-out condenser, num. aperture 1.40	425.—	Parte
			Stand I^{d} (for examin. brain sections)		
70	„	26	with ordinary condenser, num. aperture 1.20	355.—	Partero
71	„		with swing-out condenser, num. aperture 1.20	380.—	Partible
			Stand II^{a}, with revolving and centring vulcanite stage		
72	58	27	with ordinary condenser, num. aperture 1.40	290.—	Participar
73	„		with swing-out condenser, num. aperture 1.40	315.—	Particular

No.	Reference to general descriptive text		Description of Article	Price Marks	Code-words
	Page	Fig.			
			Stand IV^a, with fixed vulcanite stage		
74	60	28	with ordinary condenser, num. aperture 1.20	250.—	Partidora
75	„		with swing-out condenser, num. aperture 1.20	275.—	Partir
			Stand IV^b, with fixed vulcanite stage		
76	„		with cylinder-diaphragm, No. 21 .	174.—	Partoral
77	„		„ iris-cylinder diaphr., No. 22 .	184.—	Parvula
78	„		„ simplified illuminating apparatus, No. 37	200.—	Pasable
79	„		„ swing-out condenser, No. 38	225.—	Pasadillo
			Stand VI^a, with fixed stage		
80	62		with cylinder-diaphragm, No. 39 .	130.—	Pasage
81	„		„ iris-cylinder diaphr., No. 40 .	136.—	Pasamano
82	„	29	„ illuminat. apparatus, No. 41 .	150.—	Pasapan
83			**Stand VI^a,** with illuminating apparatus, No. 41, **in leather or canvas travelling-case** (instead of in a mahogany cabinet) **with sling strap**	158.—	Pasaporte
			Total weight of stand and travelling case about 3 kg. (6½ lbs.).		
			Stand VI^b, with revolving (but not centring) object stage		
84	64		with cylinder-diaphragm, No. 39 .	160.—	Pasavino
85	„		„ iris-cylinder diaphr., No. 40 .	166.—	Pascua
86	„		„ illuminat. apparatus, No. 41 .	180.—	Paseo
87	„	30	„ cylinder-diaphragm, No. 39, polarizer, No. 174, and selenite film in metal setting for Red of the I. Order, No. 182	208.—	Pasilargo
			Stand VII,		
88	66	31	with cylinder-diaphragm, No. 39 .	80.—	Pasionero
89	„		„ iris-cylinder diaphr., No. 40 .	86.—	Pasivo
90	„		„ illuminat. apparatus, No. 41 .	100.—	Pasmazon

No.	Reference to general descriptive text		Description of Article	Price Marks	Code-word
	Page	Fig.			
91	66	32	**Stand IX^a**	50.—	Pasquin
92	68		**Stand IX^a,** with specially constructed objective and 2 eye-pieces **(JOHNE's Microscope for the detection of trichinae)**	80.—	Pastaca
93	„	34	**Stand IX^b, (small Mineralogical Stand)**	240.—	Pastelero
94	70	33	**Hand-Microscope**	15.—	Pastilla
			Binocular Stands.		
95	74	35	**Stand X^a (GREENOUGH's Binocular Stand),** lower part interchangeable for a vulcanite fork to be attached to tube-carrier	195.—	Pastle
96	„		**Stand X^b (BRAUS-DRÜNER's Binocular Dissecting Stand)**	260.—	Pastoso
96^a	75		**Dissecting stage for Stand X^b**	60.—	Pastrana
97	„	36	**Stand X^b,** with stereoscopic camera, incl. time and instantaneous shutter . .	385.—	Pasula
98	76		**Stand X^c (CZAPSKI's Corneal Microscope)**	220.—	Patache
99	„	37	„ with base-plate and chin-rest designed by Prof. **EVERSBUSCH**	265.—	Pataleo
100	77		„ with base-plate and chin-rest as modified by Dr. **BRAUNSCHWEIG**	340.—	Patarato
			Dissecting Stands and Lens-Holders.		
101	78	38	**Dissecting Stand P I** as suggested by **PAUL MAYER**	125.—	Paterno
102	79		**Dissecting Stand P II (new Drawing Apparatus for low magnifications),** with drawing board	260.—	Patesca
103	„	39	**Dissecting Stand P II,** with drawing board, drum carrying Porro prisms, No. 192, objective a*, HUYGENIAN eye-pieces 2 and 4, lenses, Nos. 9 and 10, 4 spectacle lenses, and drawing-prism, No. 109	410.—	Paticojo

No.	Reference to general descriptive text: Page	Fig.	Description of Article	*Price Marks*	*Code-word*
104	81	40	**Dissecting Stand P III**	**70.—**	**Patin**
104a	82	40 L	**Arm for the lenses Nos. 9 and 10** . .	**4.—**	**Patinejo**
			Dissecting Stand P V		
105	„		with block for supporting the hands	**14.—**	**Patira**
106	„	41	without block	**12.—**	**Patochada**
107	83	42	**Lens-Holder L I**	**40.—**	**Patologico**
108	84	43	**Lens-Holder L II**	**15.—**	**Patriarcal**

Cases for the Stands.

All stands, except Dissecting Stand **P V** *and the Lens-Holders* **L I** *and* **L II**, *are supplied in cabinets or cases made of mahogany or other kinds of wood.*

The prices of cabinets or cases are always included in those of the stands.

In the event of a considerable number of Stands VI, VII and IX being included in one order they can be supplied without mahogany cabinets, the whole being packed together in one large packing-case. The prices would in this case be reduced by from 15—30 Marks, according to the nature of the packing required.

	85	45	**Leather Travelling** Cases to protect the mahogany cabinets, according to size required	**18–30.–**	
	„		**Nickelled Plate, including engraving of owner's name,** to screw on the door of the cabinet	**5.—**	**Patricio**
	„		**Engraving owner's name** on base of stand	**3.—**	**Patriota**

No.	Reference to general descriptive text: Page	Reference to general descriptive text: Fig.	Description of Article	Price Marks	Code-word
			Accessory Apparatus.		
			Drawing Apparatus.		
109	87	46	**Drawing Prism** (Camera lucida), old form, in case	21.—	Patron
110	88	47	**Small ABBE Drawing Camera,** prism casing and mirror tilting on hinge, in case .	30.—	Patronato
111	„	48	**Large ABBE Drawing Camera** with mirror 75 mm × 50 mm (3 × 2 in.), in case	60.—	Patudo
112	89		with mirror 125 mm × 80 mm (5 × 3 1/8 in.), for use with eye-pieces having an enlarged field of view, in case	72.—	Paulatino
113	90		**BERNHARD's Drawing Table,** for use with microscope standing upright	45.—	Pausado
114	„	49	**BERNHARD's Drawing Table,** with arrangement for inclining microscope together with table	52.—	Pautador
115	„		**Simple Drawing Board,** drawing surface inclined at angle of 25°	2.50	Pavana
116	91	50	**GILTSCH's Drawing Stand**	35.—	Pavia
			Drawing Apparatus for low magnifications, see Nos. 102 and 103, p. 128.		
			Appliances for measuring microscopic objects.		
117	92		**Eye-piece Micrometer,** 5 mm divided in tenths of a millimetre, in capsule	5.—	Pavilon
			Stage-Micrometers, in case:		
118	„		1 millimetre divided in 100 parts . .	10.—	Pavimiento
119	„		1 centimetre divided in 1/1 millim., the last divided in tenths of a millimetre .	6.—	Pavon

No.	Reference to general descriptive text: Page	Fig.	Description of Article	Price: Marks	Code-word
			Micrometer Eye-pieces for Achromatic Objectives:		
120	92	51	HUYGENIAN Eye-piece 2 or 3, with micrometer scale to drop into eye-piece	18.—	Pavonazo
121	93		with drum and screw for lateral movement of the micrometer-scale (so-called Drum Eye-piece with micrometer), in case	40.—	Pavorde
			Micrometer Eye-pieces for Apochromatic Objectives:		
122	„		Compensating Eye-piece 6 with micrometer scale to drop into eye-piece	31.—	Pavura
123	„		with drum and screw for lateral movement of the micrometer-scale (so-called Drum Eye-piece with micrometer), in case	53.—	Payaso
			PLAGGE's Micrometer Proj. Eye-pieces:		
123[a]			Projection Eye-piece 2 or 4, adapted for insertion of glass slides on which the scale is ruled	52.—	Pazpuerco
			Divided glass slides, each	10.—	Pazque
			Case to contain eye-piece and 4 slides . . .	5.—	Peajero
			The ruling of the glass slides has to be made separately for each objective intended to be used in conjunction with Micrometer Projection Eye-pieces. It is therefore necessary, when ordering the latter, also to forward the objectives for adaptation.		
124	„	52	**Screw Micrometer Eye-piece,** with RAMSDEN eye-pieces, for achromatic objectives, in case	90.—	Peal
125	94		**Screw Micrometer Eye-piece,** with Compensating Eye-piece 6, for apochromatic objectives, in case	105.—	Pebetero

No.	Reference to general descriptive text		Description of Article	Price Marks	Code-word
	Page	Fig.			
126	94	53	**Stage Screw Micrometer,** in case . . .	120.—	Peeable
			When ordering above the factory number of the stand should be quoted.		
127	95		**Goniometer Eye-piece** for achromatic objectives, HUYGENIAN Eye-pieces **2** or **3**, with divided circle, in case	35.—	Peeante
128	„		**Goniometer Eye-pieces** for apochromatic objectives, Compensating Eye-piece **4**, with divided circle, in case . .	48.—	Pecemento
			Appliances for measuring the thickness of Cover-glasses.		
129	„	54	**Cover-glass Gauge**	30.—	Peeora
130	„		**Cover-glass Gauge,** simpler construction; screw with divided drum	15.—	Pectoral
			Rules and fully divided Circles.		
131	96		**Nickel-silver Rule,** 10 cm divided in $^1/_1$ millimetres	3.50	Pecunia
			Rules on plate-glass:		
132	„		5 cm divided in $^1/_2$ mm	2.50	Pedaceria
133	„		10 cm divided in $^1/_1$ mm	3.50	Pedagogo
134	„		20 cm „ „ „ „	7.—	Pedano
135	„		30 cm „ „ „ „	12.—	Pedestal
			Rules on plate-glass with double scale (on one edge in millimetres, on the other in English inches):		
136	„		5 cm divided in $^1/_2$ mm; 2 inches divided in 48 parts	3.50	Pedido
137	„		10 cm in whole millimetres, 4 inches in 48 parts	4.50	Pediluvio

No.	Reference to general descriptive text: Page	Fig.	Description of Article	Price Marks	Code-word
			Fully divided Circles of plate-glass:		
138	96		Circle 80 mm in diameter divided in $^1/_1$ degrees	10.—	Pedometro
139	„		Circle 120 mm in diameter, divided in $^1/_2$ degrees	15.—	Pedrada
			Appliances for Counting.		
140	„		**Eye-piece Cross-line Micrometer,** in capsule	5.—	Pedregoso
141	97		**P. EHRLICH's Eye-piece Stops,** sets of seven stops	10.—	Pedril
142	„		**Counting Chamber (Cross-line stage micrometer),** with 2 cover-glasses, No. 145, in case	15.—	Pedro
			With regard to Nos. 143 and 144 see our detailed prospectus of Appliances for Counting.		
			Cover-glasses for Counting Chamber:		
145			0.4 mm or 0.6 mm thick	0.75	Pequera
146			0.18 mm thick, with cemented glass ring	3.—	Pegujar
			Apparatus for counting blood corpuscles (THOMA's Haemacytometer), Counting chamber, No. 142		
147	98	55	with mixing pipette for red corpuscles, in case	26.—	Peinada
148	„		with mixing pipette for white corpuscles, in case	26.—	Peine
149	„		with both pipettes, in case	36.—	Peirayo
			Mixing pipette separately		
150	„		for red corpuscles	9.—	Pejepalo
151	„		„ white „	9.—	Pelada
152	„		**MIESCHER's Apparatus for counting blood corpuscles,** with mixing pipette having different scales, in case	32.—	Pelafustan

No.	Reference to general descriptive text		Description of Article	Price	Code-word
	Page	Fig.		Marks	
153	98		**MIESCHER's Mixing-pipette** separately .	14.—	**Pelambre**
154	„		**Movable Stage for the Counting Chamber**	15.—	**Pelamesa**
			A detailed prospectus relating to appliances for counting blood corpuscles, yeast cells, bacteria, &c., may be obtained on application.		
			Apertometer, Test-plate, Diffraction Apparatus.		
155	99	56	**ABBE's Apertometer,** in case	70.—	**Pelar**
156	„		**ABBE's Apertometer with slot for adjustment of indices,** in case	90.—	**Pelaza**
157	100		**ABBE's Test-plate,** in case	10.—	**Peleador**
158	„		**ABBE's Diffraction Apparatus**	20.—	**Pelele**
159	„		**Diffraction-plate** separately	8.—	**Pelicabra**
			Appliances for microscopic examination in polarized light.		
			Polarizers		
160	101	57	**I.** for use on stands with the **ABBE** Illuminating Apparatus	22.—	**Pelicula**
161	„		**II.** for use on Stand **VI^{b}** with Illuminating Apparatus, No. 41, without iris-diaphragm	25.—	**Pelito**
			Analyzers		
162	102		**I.** to fit on eye-piece	15.—	**Pelmazo**
163	„		**II.** „ „ „ „ , with divided circle	30.—	**Pelon**
164	„		**III.** with adapter, for insertion above the objective	25.—	**Pelosa**

No.	Reference to general descriptive text		Description of Article	Price Marks	Code-word
	Page	Fig.			
			ABBE's Analyzer Eye-piece, with polarizing prism between the lenses of HUYGENIAN Eye-piece 2		
165	102		**I.** without divided circle	40.—	Pelotear
166	„		**II.** with divided circle	55.—	Peloton
			ABBE's Analyzer Eye-piece, with polarizing prism between the lenses of Compensating Eye-piece 4		
167			**III.** without divided circle	53.—	Peltre
168			**IV.** with divided circle	68.—	Peluca
			Combinations of Polarizers and Analyzers, in special cases		
			A: for stands using the **ABBE** Illuminating Apparatus:		
169	„		**Polarizer I** and **Analyzer II** . . .	58.—	Pelusilla
170	„		„ **I** „ „ **I** . . .	41.—	Pena
171	„		„ **I** „ **ABBE Analyzer Eye-piece II**	83.—	Penador
172	„		„ **I** „ **ABBE Analyzer Eye-piece I**	66.—	Pename
			B: for Stand **VI^{b}**:		
173	103		**Polarizer II** and **Analyzer II** . . .	61.—	Pencazo
174	„		„ **II** „ „ **I** . . .	44.—	Pendado
175	„		„ **II** „ **ABBE Analyzer Eye-piece II**	86.—	Pendencia
176	„		„ **II** „ **ABBE Analyzer Eye-piece I**	69.—	Pendiente
			Owners of a divided circle, such as that of the Goniometer Eye-piece, may use it in conjunction with the analyzer. The price of the polarizing apparatus is in this case the same as that of the combination without divided circle,		

No.	Reference to general descriptive text		Description of Article	Price Marks	Code-word
	Page	Fig.			
			with Marks 3.— additional for adaptation of the analyzer to the existing divided circle. The latter must be forwarded to us for this purpose.		
177	103	58	**Axial-image Eye-piece**	30.—	**Pendola**
178	„	59	**CZAPSKI's Iris-diaphragm with Eye-piece**	25.—	**Pendra**
179	104		**MOHL's Set of 4 Selenite and 4 Mica Films**	15.—	**Peneque**
			Selenite Films for Red of the I. Order		
180	„		mounted on paper for inserting in neck of **Polarizer I**	3.—	**Penetrar**
181	„		in metal mounts, to put into slide above the objective on Stands **I^b** and **IX^b**	4.—	**Penible**
182	105		in metal mounts, to insert between eye-piece and **Analyzers I** or **II**	4.—	**Peninsula**
			Selenite Films of other Orders		
			mounted on paper, each	2.—	
			in metal mounts, each	3.—	
			Mica Films		
			mounted on paper, each	1.50	
			in metal mounts, each	2.50	
183	„		**BRAVAIS's Double Selenite Films for Red of the I. Order,** with HUYGENIAN Eye-pieces 2 or 3	30.—	**Penitente**
184	„		**The same,** with Compensating Eye-piece 4	43.—	**Pensadero**
185	„		**BIOT-KLEIN's Quartz-plate,** in metal mount, to put into slide above the objective on Stands **I^b** and **IX^b**	6.—	**Pension**

No.	Reference to general descriptive text: Page	Fig.	Description of Article	Price Marks	Code-word
186	105		**BERTRAND's quadruple Quartz-plate,** with HUYGENIAN Eye-piece 2 or 3	35.—	**Pentagrama**
187	„		**The same,** with Compensating Eye-piece 4	48.—	**Penultima**
188	„		**Stauroscopic Calc-spar Plate** to place upon Eye-piece	7.—	**Peonada**
			Spectro-Polarizer, s. pp. 32 and 123, No. 35.		
			Cross-line Eye-pieces, s. pp. 108 and 138.		
			Eye-pieces for special purposes.		
189	106	60	**ABBE's Stereoscopic Eye-piece** (adapted for achromatic objectives only), in case . . .	180.—	**Peonia**
190	107	61	**ABBE's Spectroscopic Eye-piece (Micro-Spectroscope),** in case	200.—	**Peorus**
191	108		**ENGELMANN's Micro-Spectro-Photometer,** in case	480.—	**Pepino**
192	„		**PORRO's prisms, fitted in drum,** for erecting the images, without Eye-piece, in case	40.—	**Pepitoso**
193	„		**AMICI's Erecting Prism** (prisme redresseur), to slip upon eye-piece, in case	25.—	**Peragrar**
			Index Eye-pieces		
194	„		HUYGENIAN Eye-piece 2 or 3, with movable index	36.—	**Peraleda**
195	„		Compensating Eye-piece 6, similarly fitted	49.—	**Peranton**
195a	„		**Index** separately	1.—	**Percance**

No.	Reference to general descriptive text: Page	Reference to general descriptive text: Fig.	Description of Article	*Price Marks*	*Code-word*
	108		**Cross-line Eye-pieces.** The provision of a small glass plate with crossed lines increases the price of an eye-piece by Marks 3.—. If, in addition, the eye-piece is to be specially fitted with a focusing eye-lens, a further charge of Marks 6.— is to be added for each eye-piece.		
			Prism-rotator and Capillary Rotator.		
196	109	62	**GREENOUGH's Prism-rotator,** in case . .	62.—	Perceptor
197	„		**The same,** but **with double side-view reflection,** in case	75.—	Percudir
198	110	63	**GREENOUGH's Capillary Rotator,** in case	50.—	Perderas
			Artificial Illuminating Appliances for the Microscope.		
199	„		**Incandescent Gas Lamp, with spherical glass flask on stand**	22.—	Perdidoso
200	„		**Spherical glass flask separately** . . .	7.—	Perdigon
201	111		**Collective Lens with iris diaphragm attached to mount,** on stand with round base	30.—	Perdon
			Hand-Spectroscope and Hand-Saccharimeter.		
202	„		**BROWNING's Hand-Spectroscope,** in case without comparison prism	40.—	Perdurar
203	„		with comparison prism	46.—	Peregrina
204	„		with scale of wave-lengths . . .	80.—	Perenal
205	„	64	**Hand-Saccharimeter,** in case without telescope	90.—	Pereza
206	„		with telescope	108.—	Perfecto
206[a]	„		**Saccharimeter Stand** provided with joint	30.—	Perfidia

No.	Reference to general descriptive text		Description of Article	Price	Code-word
	Page	Fig.		Marks	
207	112		**Glass tubes,** with stopper plates, each .	7.50	**Perfil**
208	„		„ „ without „ „ „ .	3.—	**Perforar**
			The usual length of the glass tubes is 200 mm (8 in.), but tubes of 100 mm (4 in.) may also be obtained if desired.		
			Heating Appliances		
			L. PFEIFFER's Warm Chambers		
209	„		for Stands I[a] and I[b]	70.—	**Pergolo**
210	„		for Stand I[c]	70.—	**Perico**
211	„	65	for Stands II[a] and IV	60.—	**Perifolio**
			The price of a thermo-regulator and of a thermometer is included in that of the warm chamber, but micro-burners are charged separately.		
212	113		**Micro-burner** for warm chamber . . .	4.50	**Perilustre**
			L. PFEIFFER's Heating Stage		
213	„		with plane surface	9.—	**Perineo**
214	114		with three concavities	15.—	**Periodo**
215	„		**Thermo-regulator** for above	10.—	**Periplo**
216	„		**ZOTH's Cooling Trough, with thermometer,** to serve also as a heating stage	18.—	**Peritoneo**
			Miscellaneous other Accessories.		
217	„		**MALTWOOD's Finder,** in case	20.—	**Perlado**
218	„		**BORN-PETER's Orientation-plate,** with pair of glass set-squares	40.—	**Perlongar**
219	„		**Pair of glass Set-squares** separately . .	10.—	**Permeable**
220	„		**Turn-Table (tournette)** on wood base for ringing specimens	11.—	**Permitir**

Microtomes.

The construction of microtomes has within recent years undergone so many modifications, and many of them have become so complicated, that it is only in workshops specially fitted out for the purpose that they can be turned out successfully and in accordance with the requirements of the day. We have therefore entirely discontinued the manufacture of microtomes.

But in order to meet the requirements of our customers abroad we shall at all times be pleased to obtain from the best sources, and supply at maker's prices,

Microtomes,
Cases of Dissecting Instruments,
Microscopic Preparations

which may be required to supplement any microscopic outfit purchased from us.

Bell-Glasses, Slides, Cover-Glasses.

No.	Description of Article	*Price Marks*	*Code-word*
	Bell-glasses for covering up microscopes (dust-proof), incl. a stout cloth-covered mill-board base.		
221	Large size, about 38 cm (15 in.) high, 24 cm ($9\frac{1}{2}$ in.) inside diameter	10.—	Perneador
222	Smaller size, about 35 cm, (14 in.) high, 20 cm (8 in.) inside diameter	8.—	Perneria
	Plane ground-glass disks to use as bed-plates for these bell-glasses		
223	for the large bell-glasses	7.—	Pernigon
224	„ „ smaller „ „	5.50	Pernoctar
225	**Slides of the Giessen size,** 48×28 mm ($1\frac{7}{8}\times1\frac{1}{8}$):		
	a) white crown-glass with unground edges, per 100	2.—	Perolillo
	b) „ „ „ „ ground „ „ „	3.—	Perpasar

No.	Description of Article	Price Marks	Code- word
	c) best white plate-glass with ground edges, per 100	4.—	Perpetrar
226	**Slides of the English size,** 76 mm × 26 mm (3 × 1 in.):		
	a) white crown-glass with unground edges, per 100	2.50	Perplejo
	b) white crown-glass with ground edges, per 100	3.50	Perquerir
	c) best white plate-glass with ground edges, per 100	7.50	Perrezno
227	**Slides of extra large size,** 87 mm × 37 mm ($3^3/_8 \times 1^1/_2$ in.):		
	a) white crown-glass with unground edges, per 100	3.50	Persequir
	b) white crown-glass with ground edges, per 100	5.—	Persignar
	c) best white plate-glass with ground edges, per 100	9.—	Persistir
228	**Hollow Slides:**		
	a) small size, 55 mm × 32 mm ($2^1/_4 \times 1^1/_4$ in.), of best make and finish, edges bevelled, each . . .	0.50	Personaza
	b) extra large size, 87 mm × 37 mm, ($3^3/_8 \times 1^1/_2$ in.), of best make and finish, edges bevelled and polished, 5 mm thick, each	1.—	Personilla
229	**Slides with cemented glass rings,** for moist chambers, 1 or 2 mm deep, each	0.80	Persuadir
230	**Cover-glasses, Squares:**		
	a) size: 24 mm □, per 100	4.70	Persuasor
	b) „ 21 „ „ „ „	3.60	Pertinace
	c) „ 18 „ „ „ „	2.70	Perturbar
	d) „ 15 „ „ „ „	1.80	Perulera
	e) „ 12 „ „ „ „	1.—	Perverso

No.	Description of Article	*Price* *Marks*	*Code-word*
231	**Cover-glasses, Circles:**		
	a) size: 24 mm diameter, per 100	**6.90**	**Pesadilla**
	b) „ 21 „ „ „ „	**5.50**	**Pesalicor**
	c) „ 18 „ „ „ „	**4.20**	**Pesaroso**
	d) „ 15 „ „ „ „	**3.—**	**Pescadora**
	e) „ 12 „ „ „ „	**1.50**	**Pescozon**
232	**Cover-glasses, Oblongs:**		
	a) size: 32 mm × 24 mm, per 100	**6.—**	**Pesebre**
	b) „ 24 „ × 21 „ „ „	**4.50**	**Pespuntar**
	The thickness of the above cover-glasses varies between 0,15 mm and 0,22 mm; one third must be added to the prices quoted if covers of special given thickness are required.		

Complete Microscopes.

As a convenient guide to the selection of stands and their optical equipment, together with the requisite accessory apparatus, we append a number of combinations suitable for a great variety of purposes. It is not, however, our intention to place the least restriction on the free choice of our customers.

In ordering a set corresponding to one of the specifications it will be sufficient to quote either the respective number and the total cost or the code-word.

We have thought it the best plan to group our proposed combinations in the following order:

A. Complete microscopic outfits, comprising all the more important accessory apparatus.

B. Complete microscopes, equipped with only the most indispensable accessory apparatus, but generally sufficient for histological, bacteriological, botanical and zoological research.

C. Microscopes suitable for specific purposes.

D. Binocular and dissecting microscopes.

A. Complete Microscopic Outfits, comprising all the more important Accessory Apparatus.

Specification 1.

Apochromatic Objectives:

16 mm	8 mm	4 mm		
0.30 num. Ap.	0.65 num. Ap.	0.95 num. Ap.		
80.—	100.—	140.—	. . . Mk.	320.—
2.5 mm	(Water Immersion)	. . . . .	„	250.—
1.25 num. Ap.				
2 mm	3 mm	(Homog. Immers.)		
1.30 num. Ap.	1.40 num. Ap.			
300.—	400.—	. . . . .	„	700.—

Compensating Eye-pieces:

2	4	8	12	18			
20.—	20.—	30.—	30.—	25.—	. . . . .	„	125.—
6 (Micrometer Eye-piece, No. 122)					. . . . .	„	31.—

Achromatic Objectives:

a_0	a_2	a*	aa	B			
12.—	12.—	40.—	27.—	30.—	. . . . .	„	121.—
Pl	D*	(Water Immersion)					
20.—	75.—	. . . . .			. . . . .	„	95.—

Huygenian Eye-pieces:

1, 4, 5	. . . . .	„	21.—
2 with cross lines and adjustable eye-lens	. . . . .	„	16.—
3 (Micrometer Eye-piece, No. 120)	. . . . .	„	18.— Mk. 1697.—
Glass cell for the Plankton-searcher	. . . . .	„	3.50
Centring Achromatic Condenser, No. 29	. . . . .	„	75.—
Engelmann's Micro-spectral Objective, No. 34	. . . . .	„	160.—
Vertical Illuminator, No. 42	. . . . .	„	18.—
Revolving Vulcanite Stage, No. 45	. . . . .	„	25.—
Revolving Nose-piece for 4 objectives, No. 50	. . . . .	„	32.—
Tube-slide, No. 52	. . . . .	„	10.—
6 Objective-slides, No. 53	. . . . .	„	60.—
Case to hold 6 Objective-slides, No. 55	. . . . .	„	15.—
Drawing Apparatus, No. 111	. . . . .	„	60.—
Drawing-table, No. 114	. . . . .	„	52.—
Stage Micrometer, No. 118	. . . . .	„	10.—
Screw Micrometer Eye-piece, No. 125	. . . . .	„	105.—
Stage Screw-Micrometer, No. 126	. . . . .	„	120.—
Cover-glass Gauge, No. 129	. . . . .	„	30.—
Rules on plate-glass, No. 132 & 134	. . . . .	„	9.50
Fully divided Circle, No. 139	. . . . .	„	15.— „ 800.—
		Carried forward	Mk. 2497.—

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

					Code-words
	Brought forward		Mk. 2497.—		
Haemacytometer, No. 149	Mk.	36.—			
Apertometer, No. 156	„	90.—			
Test-plate, No. 157	„	10.—			
Diffraction Apparatus, No. 158	„	20.—			
Polarizing Apparatus, No. 169	„	58.—			
Assortment of Selenite and Mica Films, No. 179	„	15.—			
Spectroscopic Eye-piece, No. 190	„	200.—			
Drum fitted with PORRO-prisms, No. 192	„	40.—			
Index Eye-piece, No. 195	„	49.—			
Prism-rotator, No. 197	„	75.—			
Capillary Rotator, No. 198	„	50.—			
Incandescent Gas Lamp with spherical glass flask, No. 199	„	22.—			
Collective Lens with iris-diaphragm, No. 201	„	30.—			
Hand-Saccharimeter No. 206	„	108.—			
Heating Stage, No. 214	„	15.—			
Thermo-regulator, No. 215	„	10.—			
MALTWOOD's Finder, No. 217	„	20.—			
BORN-PETER's Orientation Plate, No. 218	„	40.—			
Turn-table, No. 220	„	11.—			
			„ 899.—		
Outfit completed by adding:					
a) Stand I[a], No. 59	„	400.—			
Leather travelling case	„	30.—			
Packing	„	9.—	„ 439.—	Mk. **3835.—**	**Pestifero**
or					
b) Stand I[c], No. 67	„	425.—			
Leather travelling case	„	30.—			
Packing	„	9.—	„ 464.—	Mk. **3860.—**	**Pesunita**

As a suitable complement to this combination for dissecting purposes we recommend the addition of one of the Sets Nos. 19, 20, 22, 23. If Set 19 be chosen, the prism-rotator and the capillary rotator specified under No. 19[a] would in that case be omitted.

Specification 2.

Achromatic Objectives:

a_0	a_2	a*	aa	AA	B	C	DD		
12.—	12.—	40.—	27.—	30.—	30.—	36.—	54.—	Mk.	241.—

E with correction collar 86.— **F** with correction collar 104.— „ 190.—

Pl 20.— **D*** 75.— **J** with correction collar (Water Immers.) 164.— „ 259.—

$\frac{1''}{12}$ (Homog. Immersion) „ 160.—

HUYGENIAN Eye-pieces:

1, 2, 4, 5 „ 28.—

3 (Micrometer Eye-piece, No. 120) „ 18.— Mk. 896.—

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

					Code-words
	Brought forward		Mk. 896.—		
Glass cell for the Plankton-searcher	Mk.	3.50			
Vertical Illuminator, No. 42	„	18.—			
Revolving Vulcanite Stage, No. 45	„	25.—			
Revolving Nose-piece for 4 objectives, No. 50	„	32.—			
Drawing Apparatus, No. 111	„	60.—			
Drawing-table, No. 114	„	52.—			
Stage Micrometer, No. 118	„	10.—			
Screw Micrometer Eye-piece, No. 124	„	90.—			
Cover-glass Gauge, No. 130	„	15.—			
Haemacytometer, No. 149	„	36.—			
Apertometer, No. 155	„	70.—			
Test-plate, No. 157	„	10.—			
Polarizing Apparatus, No. 169	„	58.—			
Selenite Film for Red of the I. Order, No. 180	„	3.—			
Spectroscopic Eye-piece, No. 190	„	200.—			
Drum fitted with PORRO-prisms, No. 192	„	40.—			
Index Eye-piece, No. 194	„	36.—			
Prism-rotator, No. 196	„	62.—			
Capillary Rotator, No. 198	„	50.—			
Incandescent Gas Lamp with spherical glass flask, No. 199	„	22.—			
Collective Lens with iris-diaphragm, No. 201	„	30.—			
MALTWOOD's Finder, No. 217	„	20.—			
			„ 942.50		
Outfit completed by adding:					
a) Stand I[a], No. 58	„	375.—			
Leather travelling case	„	30.—			
Packing	„	8.—	„ 413.—	Mk. **2251.50**	**Petardear**
or					
b) Stand I[c], No. 66	„	400.—			
Leather travelling case	„	30.—			
Packing	„	8.—	„ 438.—	„ **2276.50**	**Petequias**
or					
c) Stand II[a], No. 72	„	290.—			
Leather travelling case	„	26.—			
Packing	„	8.—	„ 324.—	„ **2137.50**	**Petifoque**

Stand II[a] being equipped with a revolving vulcanite stage, No. 45, that item, amounting to Mk. 25.—, is omitted from Set 2[c].

We recommend the addition of either Specification No. 20 or No. 22 as a suitable complement for dissecting purposes.

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

Code-words

B. Complete Microscopes, equipped with only the most indispensable accessory apparatus, but generally sufficient for histological, bacteriological, botanical and zoological research.

Specification 3.

Apochromatic Objectives:

16 mm	8 mm	4 mm			
0.30 num. Ap.	0.65 num. Ap.	0.95 num. Ap.			
80.—	100.—	140.—	. . . . .	Mk. 320.—	
2 mm	(Homogeneous Immersion)		. . . . .	„ 300.—	
1.30 num. Ap.					

Compensating Eye-pieces:

2	4	8	12				
20.—	20.—	30.—	30.—	. . . . .	„ 100.—		
6 (Micrometer Eye-piece, No. 122)				. . . . .	„ 31.—	Mk. 751.—	
Tube-slide, No. 52				. . . . .	„ 10.—		
4 Objective-slides, No. 53				. . . . .	„ 40.—		
Case to hold 6 Objective-slides, No. 55				. . . . .	„ 15.—		
Drawing Apparatus, No. 111				. . . . .	„ 60.—		
Stage Micrometer, No. 118				. . . . .	„ 10.—		
Counting Chamber, No. 142				. . . . .	„ 15.—	„ 150.—	

Outfit completed by adding:

a) **Stand Ia, No. 59**	„ 400.—				
Polarizing Apparatus, No. 169, and Selenite Film, No. 180	„ 61.—				
Packing	„ 4.—	„ 465.—	Mk. **1366.—**	**Petitorio**
or					
b) **Stand Ic, No. 67**	„ 425.—				
Polarizing Apparatus, No. 169, and Selenite Film, No. 180	„ 61.—				
Packing	„ 4.—	„ 490.—	„ **1391.—**	**Petrificar**
or					
c) **Stand IIa, No. 73**	„ 315.—				
Polarizing Apparatus, No. 169, and Selenite Film, No. 180	„ 61.—				
Packing	„ 3.50	„ 379.50	„ **1280.50**	**Petroleo**
or					
d) **Stand IVa, No. 74**	„ 250.—				
Small Mechanical Stage, No. 47	„ 120.—				
Packing	„ 3.50	„ 373.50	„ **1274.50**	**Peucedano**

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

Code-words

Specification 4.

Achromatic Objectives:

a_2	a*	AA	C	DD	F					
12.—	40.—	30.—	36.—	54.—	84.—	. . . . .	Mk.	256.—		
Pl	**D***	**J** (Water Immersion)								
20.—	75.—	144.—				. . . . .	„	239.—		
$\frac{1''}{12}$ (Homog. Immersion)						. . . . .	„	160.—		
HUYGENIAN Eye-pieces:										
1, 2, 4, 5						. . . . .	„	28.—		
3 (Micrometer Eye-piece, No. 120)						. . . . .	„	18.—	Mk.	701.—
Glass cell for the Plankton-searcher						. . . . .	„	3.50		
Revolving Nose-piece for 4 Objectives, No. 50						. . . . .	„	32.—		
Drawing Apparatus, No. 111						. . . . .	„	60.—		
Stage Micrometer, No. 118						. . . . .	„	10.—		
Counting Chamber, No. 142						. . . . .	„	15.—	„	120.50

Outfit completed by adding:

a) **Stand I^a**, No. 56 . . . . . „ 300.—
Polarizing Apparatus, No. 170, and **Selenite Film**, No. 180 . . . . . „ 44.—
Packing „ 4.— „ 348.— Mk. **1169.50** **Piariego**

or

b) **Stand I^c**, No. 64 . . . . . „ 325.—
Polarizing Apparatus, No. 170, and **Selenite Film**, No. 180 . . . . . „ 44.—
Packing „ 4.— „ 373.— „ **1194.50** **Picacureba**

or

c) **Stand II^a**, No. 72 . . . . . „ 290.—
Polarizing Apparatus, No. 170, and **Selenite Film**, No. 180 . . . . . „ 44.—
Packing „ 3.50 „ 337.50 „ **1159.—** **Picahigos**

or

d) **Stand IV^a**, No. 74 . . . . . „ 250.—
Packing „ 3.50 „ 253.50 „ **1075.—** **Picaporte**

or

e) **Stand VI^a**, No. 82 . . . . . „ 150.—
Packing „ 2.50 „ 152.50 „ **974.—** **Picaresca**

or

f) **Stand VI^b**, No. 87 . . . . . „ 208.—
Packing „ 2.50 „ 210.50 „ **1032.—** **Picatorte**

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

C. Microscopes suitable for specific purposes.

Code-words

Specification 5.

Microscopes for bacteriological research.

(A suitable outfit for clinical laboratories, hospitals, hygienic institutions, medical practitioners and veterinary surgeons.)

Achromatic Objectives:

AA	DD						
30.—	54.—	. . . . .	Mk.	84.—			
Apochromatic homogeneous-immersion Objective							
2 mm / 1.30 num. Ap.		. . . . .	„	300.—			
Huygenian Eye-pieces:							
2, 4		. . . . .	„	14.—			
Compensating Eye-pieces:							
4	8						
20.—	30.—	. . . . .	„	50.—			
6 (Micrometer Eye-piece, No. 122)		. . . . .	„	31.—			
Revolving Nose-piece for 3 Objectives, No. 49		. . . . .	„	27.—	Mk.	506.—	
Outfit completed by adding:							
a) Stand I^a, No. 57		. . . . .	„	325.—			
Leather travelling case		. . . . .	„	30.—			
		Packing	„	3.50	„	358.50	Mk. 864.50 **Picolete**
or							
b) Stand II^a, No. 73		. . . . .	„	315.—			
Leather travelling case		. . . . .	„	26.—			
		Packing	„	3.—	„	344.—	„ 850.— **Picoteado**
or							
c) Stand IV^a, No. 75		. . . . .	„	275.—			
Leather travelling case		. . . . .	„	26.—			
		Packing	„	3.—	„	304.—	„ 810.— **Picoverde**

Specification 6.

Microscopes for similar purposes, but less expensive.

Achromatic Objectives:

A	DD						
24.—	54.—	. . . . .	Mk.	78.—			
$\frac{1''}{12}$ (Homogeneous Immersion)		. . . . .	„	160.—			
Huygenian Eye-pieces:							
2, 4		. . . . .	„	14.—			
3 (Micrometer Eye-piece, No. 120)		. . . . .	„	18.—			
Revolving Nose-piece for 3 Objectives, No. 49		. . . . .	„	27.—	Mk.	297.—	

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

					Code-words
	Brought forward	Mk. 297.—			*Code-words*
Outfit completed by adding:					
a) **Stand I^a**, No. 56	Mk. 300.—				
Packing	„ 3.50	„ 303.50	Mk.	600.50	**Pichancha**
or					
b) **Stand II^a**, No. 72	„ 290.—				
Packing	„ 2.50	„ 292.50	„	589.50	**Pielago**
or					
c) **Stand IV^a**, No. 74	„ 250.—				
Packing	„ 2.50	„ 252.50	„	549.50	**Pierides**
or					
d) **Stand VI^a**, No. 82	„ 150.—				
Packing	„ 2.—	„ 152.—	„	449.—	**Pietismo**
or					
e) **Stand VI^a**, No. 83 (Travelling Microscope) . . .	„ 158.—				
Packing	„ 2.—	„ 160.—	„	457.—	**Piezgo**

The optical details enumerated in Specifications 5 and 6 were adopted for the microscopes used in the Prussian Military Hospitals. Professor R. KOCH declares them to be indispensable in bacteriological research.

The total cost of Specification 6 may be still further reduced by omitting the micrometer eye-piece and by substituting objective **D** for **DD**, which would result in a saving of Mk. 30.—.

Specification 7.

Microscopes for histological, botanical and zoological investigations.

Achromatic Objectives:		
a_2 a* A C E		
12.— 40.— 24.— 36.— 66.—	Mk. 178.—	
Pl (Water Immersion)	„ 20.—	
$\frac{1''}{12}$ (Homogeneous Immersion)	„ 160.—	
HUYGENIAN Eye-pieces:		
2, 4	„ 14.—	
3 (Micrometer Eye-piece, No. 120)	„ 18.—	Mk. 390.—
Glass cell for the Plankton-searcher	„ 3.50	
Revolving Nose-piece for 3 Objectives, No. 49	„ 27.—	
Drawing Apparatus, No. 111	„ 60.—	
Stage Micrometer, No. 118	„ 10.—	„ 100.50
		Mk. 490.50

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

					Code-words
Outfit completed by adding:	Brought forward	Mk. 490.50			
a) **Stand Ia**, No. 57	Mk. 325.—				
Packing	„ 3.50	„ 328.50	Mk.	819.—	**Pigricia**
or					
b) **Stand Ic**, No. 65	„ 350.—				
Packing	„ 3.50	„ 353.50	„	844.—	**Pilosela**
or					
c) **Stand IIa**, No. 73	„ 315.—				
Packing	„ 2.50	„ 317.50	„	808.—	**Pimpineia**
or					
d) **Stand IVa**, No. 75	„ 275.—				
Packing	„ 2.50	„ 277.50	„	768.—	**Pincelada**
or					
e) **Stand VIa**, No. 82	„ 150.—				
Packing	„ 2.—	„ 152.—	„	642.50	**Pinforte**

Specification 8.
Microscopes for similar purposes, but less expensive.

Achromatic Objectives:

a_2	**A**	**C**	**E**			
12.—	24.—	36.—	66.—	Mk. 138.—		
$\frac{1}{12}$ " (Homogeneous Immersion)				„ 160.—		
Huygenian Eye-pieces:						
2, 4				„ 14.—		
3 (Micrometer Eye-piece, No. 120)				„ 18.—	Mk. 330.—	
Revolving Nose-piece for 3 Objectives, No. 49				„ 27.—		
Drawing-prism, No. 109				„ 21.—		
Drawing-board, No. 115				„ 2.50		
Stage Micrometer, No. 118				„ 10.—	„ 60.50	
Outfit completed by adding:						
a) **Stand IIa**, No. 72				„ 290.—		
Packing				„ 3.—	„ 293.—	Mk. 683.50 **Pinifero**
or						
b) **Stand IVa**, No. 74				„ 250.—		
Packing				„ 3.—	„ 253.—	„ 643.50 **Pintoresco**
or						
c) **Stand VIa**, No. 82				„ 150.—		
Packing				„ 2.50	„ 152.50	„ 543.— **Piojuelo**
or						
d) **Stand VIb**, No. 86				„ 180.—		
Packing				„ 2.50	„ 182.50	„ 573.— **Piplripao**

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

Specification 9.

Code-words

Microscopes adapted for histological, botanical and zoological Courses;

also in accordance with the German regulations for the conduct of pharmacies.

Achromatic Objectives:

a_2	A	D						
12.—	24.—	42.—	Mk.	78.—				
HUYGENIAN **Eye-pieces:**								
2, 4			„	14.—				
Eye-piece Micrometer, No. 117			„	5.—	Mk.	97.—		
Outfit completed by adding:								
a) **Stand VI^a, No. 80**			„	130.—				
		Packing	„	1.80	„	131.80	Mk. 228.80	**Piracanta**
or (where a polarizing apparatus is required)								
b) **Stand VI^b, No. 87**			„	208.—				
		Packing	„	1.80	„	209.80	„ 306.80	**Pirausta**
or								
c) **Stand VII, No. 88**			„	80.—				
		Packing	„	1.50	„	81.50	„ 178.50	**Pirlitero**

Specification 10.

Microscopes adapted for histological investigation in polarized light.

Achromatic Objectives:

a_2	A	DD						
12.—	24.—	54.—	Mk.	90.—				
$\frac{1}{12}$" (Homogeneous Immersion)			„	160.—				
HUYGENIAN **Eye-pieces:**								
2, 4			„	14.—				
3 (Micrometer Eye-piece, No. 120)			„	18.—	Mk.	282.—		
Outfit completed by adding:								
a) **Stand I^a, No. 57**			„	325.—				
Polarizing Apparatus, No. 170, and Selenite Film, No. 180			„	44.—				
		Packing	„	3.50	„	372.50	Mk. 654.50	**Pirriquio**
or								
b) **Stand I^c, No. 65**			„	350.—				
Polarizing Apparatus, No. 170, and Selenite Film, No. 180			„	44.—				
		Packing	„	3.50	„	397.50	„ 679.50	**Pisafalto**
or								
c) **Stand II^a, No. 73**			„	315.—				
Polarizing Apparatus, No. 170, and Selenite Film, No. 180			„	44.—				
		Packing	„	2.50	„	361.50	„ 643.50	**Pisolita**
or								
d) **Stand VI^b, No. 87**			„	208.—				
		Packing	„	2.—	„	210.—	„ 492.—	**Pistolear**

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

Code-words

Specification 11.

Microscopes adapted for mineralogical and crystallographic investigations.

Achromatic Objectives:

a_2	A	DD	F					
12.—	24.—	54.—	84.—	Mk.	174.—			
$\frac{1}{12}$" (Homogeneous Immersion)				„	160.—			

HUYGENIAN Eye-pieces with cross-lines:

1, 2, 4	„	30.—		
3 (Micrometer Eye-piece, No. 120)	„	18.—	Mk.	382.—
Adjustable **Iris-diaphragm** with eye-piece, No. 178	„	25.—		
BERTRAND'S **Eye-piece**, No. 186	„	35.—		
Stauroscopic Calc-spar Plate, No. 188	„	7.—	„	67.—

Outfit completed by adding:

a) **Stand I^b**, No. 63	„	600.—				
Goniometer Eye-piece, No. 127 (without divided circle)	„	20.—				
Packing	„	4.—	„	624.—	Mk. **1073.—**	**Pistoresa**
or						
b) **Stand I^b**, No. 60	„	500.—				
Goniometer Eye-piece, No. 127 (without divided circle)	„	20.—				
Packing	„	4.—	„	524.—	„ **973.—**	**Pitirojo**
or						
c) **Stand VI^b**, No. 87	„	208.—				
Goniometer Eye-piece, No. 127 (with divided circle)	„	35.—				
Packing	„	2.—	„	245.—	„ **694.—**	**Pitonista**

Specification 12.

Microscopes for mineralogical and crystallographic courses.

Achromatic Objectives:

A	D			
24.—	42.—	Mk.	66.—	
HUYGENIAN Eye-pieces with cross-lines:				
2, 4	„	20.—	Mk.	86.—

Outfit completed by adding:

a) **Stand VI^b**, No. 87	„	208.—			
Packing	„	2.—	„	210.—	Mk. **296.—** **Pizarrero**
or					
b) **Stand IX^b**, No. 93	„	240.—			
Packing	„	2.—	„	242.—	„ **328.—** **Plebeismo**

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

Specification 13.

Code-words

Microscopes specially adapted for chemical laboratories, for paper and celluloid factories, and for breweries.

Achromatic Objectives:

a_2	A	D						
12.—	24.—	42.—			Mk.	78.—		
$\frac{1}{12}$ " (Homogeneous Immersion)					„	160.—		
Huygenian Eye-pieces:								
2, 4					„	14.—		
3 (Micrometer Eye-piece, No. 120)					„	18.—	Mk. 270.—	
Revolving Nose-piece for 3 Objectives, No. 49					„	27.—		
Stage Micrometer, No. 118					„	10.—		
Counting Chamber, No. 142					„	15.—	„ 52.—	
Outfit completed by adding:								
a) Stand I[a], No. 58					„	375.—		
Polarizing Apparatus, No. 170, and Selenite Film, No. 180					„	44.—		
				Packing	„	3.50	„ 422.50	Mk. 744.50 Plebiscito
or								
b) Stand II[a], No. 72					„	290.—		
Polarizing Apparatus, No. 170, and Selenite Film, No. 180					„	44.—		
				Packing	„	2.50	„ 336.50	„ 658.50 Plegadizo
or								
c) Stand VI[b], No. 87					„	208.—		
				Packing	„	2.—	„ 210.—	„ 532.— Plenamar

Specification 14.

Microscopes for similar purposes, but somewhat cheaper.

Achromatic Objectives:

A	C	E						
24.—	36.—	66.—			Mk.	126.—		
Huygenian Eye-pieces:								
2, 4					„	14.—		
3 (Micrometer Eye-pieces, No. 120)					„	18.—	Mk. 158.—	
Revolving Nose-piece for 3 Objectives, No. 49					„	27.—		
Counting Chamber, No. 142					„	15.—	„ 42.—	
Outfit completed by adding:								
a) Stand VI[b], No. 87					„	208.—		
				Packing	„	2.—	„ 210.—	Mk. 410.— Pleonasmo
or								
b) Stand VII, No. 90					„	100.—		
				Packing	„	1.50	„ 101.50	„ 301.50 Plicacion

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

Specification 15.

Code-words

Specially suitable for customs examinations of textile goods, &c.

Achromatic Objectives:

a_2	A	D					
12.—	24.—	42.—	Mk.	78.—			
HUYGENIAN Eye-pieces:							
2, 4			„	14.—			
3 (Micrometer Eye-piece, No. 120)			„	18.—	Mk.	110.—	
Outfit completed by adding:							
a) Stand VI^b, No. 87			„	208.—			
		Packing	„	2.—	„	210.—	Mk. 320.— **Plumacolo**
or							
b) Stand VII, No. 88			„	80.—			
		Packing	„	1.50	„	81.50	„ 191.50 **Pluralidad**

Specification 16.

For the examination of opaque objects, metal specimens, &c.

Achromatic Objectives:

a_2	A	C	E					
12.—	24.—	36.—	66.—	Mk.	138.—			
$\frac{1}{12}$" (Homogeneous Immersion)				„	160.—			
HUYGENIAN Eye-pieces:								
2, 4				„	14.—			
3 (Micrometer Eye-piece, No. 120)				„	18.—	Mk.	330.—	
Vertical Illuminator, No. 42				„	18.—			
Collective Lens with iris-diaphragm, No. 201				„	30.—	„	48.—	
Outfit completed by adding:								
a) Stand I^c, No. 66				„	400.—			
			Packing	„	3.50	„	403.50	Mk. 781.50 **Pluvioso**
or								
b) Stand IV^b, No. 76				„	174.—			
Small Mechanical Stage, No. 46				„	85.—			
			Packing	„	3.—	„	262.—	„ 640.— **Poblacion**
or								
c) Stand VI^a, No. 80				„	130.—			
			Packing	„	2.—	„	132.—	„ 510.— **Povreza**

Specification 17.

Microscopes for similar purposes, but somewhat cheaper.

Achromatic Objectives:

a_2	A	C					
12.—	24.—	36.—	Mk.	72.—			
HUYGENIAN Eye-pieces:							
2, 4			„	14.—	Mk.	86.—	

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

						Code-words
	Brought forward		Mk. 86.—			
Vertical Illuminator, No. 42	Mk.	18.—				
Collective Lens with iris-diaphragm, No. 201	„	30.—	„ 48.—			
Outfit completed by adding:						
a) Stand VI[a], No. 80	„	130.—				
Packing	„	2.—	„ 132.—	Mk.	266.—	**Podagrico**
or						
b) Stand IX[a], No. 91	„	50.—				
Packing	„	2.—	„ 52.—	„	186.—	**Poetastro**

Specification 18.

JOHNE's Microscope for the detection of Trichinae.

Stand IX[a] with specially constructed objective and 2 eye-pieces	Mk.	80.—			
Packing	„	1.50	Mk.	81.50	**Pastaca**

D. Binocular Microscopes and Dissecting Combinations.

Specification 19.

Binocular Microscopes.

Pairs of Objectives:

(55)	(a_0)	(a_2)	(a_3)	(Pl)				
45.—	45.—	45.—	45.—	55.—	Mk.	235.—		
Pairs of Eye-pieces:								
1, 2, 3, Orthom. Eye-piece 4					„	56.—	Mk. 291.—	
Cell for the Plankton-searcher							„ 3.50	
Outfit completed by adding:								
a) Stand X[a], No. 95					„	195.—		
Prism-rotator, No. 197					„	75.—		
Capillary Rotator, No. 198					„	50.—		
Packing					„	4.—	„ 324.—	Mk. 618.50 **Polarizar**
or								
b) Stand X[b], No. 96					„	260.—		
Dissecting Stage, No. 96[a]					„	60.—		
Packing					„	5.50	„ 325.50	„ 620.— **Polegar**

Specification 20.

Less expensive Binocular Microscopes.

Pairs of Objectives:

(a_0)	(a_2)			
45.—	45.—	Mk.	90.—	
Pairs of Eye-pieces:				
2, Orthom. Eye-piece 4		„	28.—	Mk. 118.—

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

					Code-words
Outfit completed by adding:	Brought forward		Mk. 118.—		
a) Stand X^a, No. 95	Mk. 195.—				
	Packing „ 3.—	„ 198.—	Mk.	316.—	Polideza
or					
b) Stand X^b, No. 96	„ 260.—				
	Packing „ 4.50	„ 264.50	„	382.50	Poligamio

Specification 21.
Corneal Microscope (see p. 76).

Pairs of Objectives:

(55)	(a_0)				
45.—	45.—	Mk. 90.—			
Pairs of Eye-pieces:					
2, Orthom. Eye-piece 4		„ 28.—	Mk. 118.—		
Outfit completed by adding:					
a) Stand X^c, No. 98		„ 220.—			
		Packing „ 2.50	„ 222.50	Mk. 340.50	Poliglota
or					
b) Stand X^c, No. 99		„ 265.—			
		Packing „ 5.50	„ 270.50	„ 388.50	Polihedro

Specification 22.
Dissecting Microscopes.

Dissecting Combination-lens, No. 1	Mk. 40.—				
Improved Aplanatic Lenses, Nos. 9 and 10	„ 36.—	Mk. 76.—			
Outfit completed by adding:					
a) Dissecting Stand P I, No. 101	„ 125.—				
	Packing „ 1.50	„ 126.50	Mk.	202.50	Politico
or					
b) Dissecting Stand P III, No. 104	„ 70.—				
with the special arm designed to support lenses 9 and 10, No. 104^a	„ 4.—				
	Packing „ 1.—	„ 75.—	„	151.—	Polvillo

Specification 23.
Combined new Drawing Apparatus for low magnifications and Dissecting Stand for large objects.

Dissecting Stand P II, No. 103 (See details on pp. 79—81 and 128)	Mk. 410.—			
	Packing „ 5.50	Mk.	415.50	Patlcojo

In the event of a microtome being required as well we shall be pleased to supply it at the maker's catalogue price (see notice on p. 140).

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